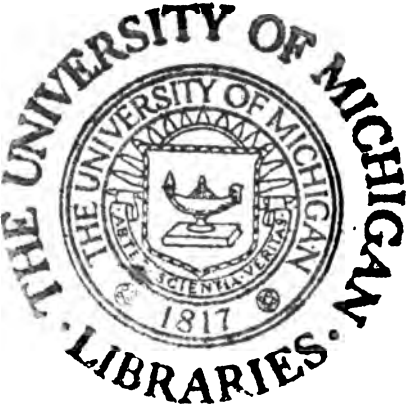
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SYNOPSIS

OF

BRITISH SEAWEEDS,

COMPILED

William Henry
PROFESSOR HARVEY'S

Phycologia Britannica.

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PREFACE.

THE Publisher of the 'Phycologia Britannica,' considering that a re-issue of that work in a cheaper and more compendious form would be acceptable to many collectors of British Seaweeds, has prepared in this Volume an abstract of the Letter-press, accompanied by an Atlas of Figures copied on a reduced scale from the original Plates; and has requested me to state in this place that he has my sanction for doing so. To this I have readily consented, and have also looked over the sheets as they passed through the press, and suggested some verbal alterations. The Plates, as far as they have been finished, give fair representations of the portions of the original figures copied, and shall continue to receive my attention as the publication progresses.

I have not interfered with the classification and compression of the matter, chiefly because my views of arrangement have undergone some change, and I feel I could not do justice to any new edition of the work without recasting several of the generic characters and making other alterations. Since the completion of the 'Phycologia Bri-

tannica,' Professor Agardh has published his new arrangement of *Rhodospermeæ*, based on a more accurate examination of the conceptacular fruit or "sporiferous nucleus;" and this mode of classification, which I should adopt in any New Edition, would involve many changes of name and transposition of place from one family to another. I have however given in an Appendix the Agardhian arrangement of *Rhodospermeæ*, adopted by me in my more recent publication, the 'Nereis Boreali-Americana,' so far as the British Flora is concerned; and also an inventory of the species added to the British list since the 'Phycologia Britannica' was completed.

W. H. H.

Trin. Coll. Dublin,
July 21, 1857.

CONTENTS.

SYNOPSIS

OF

BRITISH SEAWEEDS.

ORDERS AND GENERA.

Sub-class I. MELANOSPERMEÆ or FUCALES.
(Olive Seaweeds.)

Order 1. Fucaceæ. *Olive-coloured, inarticulate seaweeds, whose* spores *are contained in spherical cavities of the frond.*

* *Air-vessels stalked.*

I. Sargassum. *Branches* bearing ribbed leaves. *Air-vessels* simple.

II. Halidrys. *Frond* linear, pinnate, leafless. *Air-vessels* plurilocular.

** *Air-vessels immersed in the frond, or none.*

III. Cystoseira. *Root* scutate. *Frond* much branched, bushy. *Receptacles* cellular.

IV. Pycnophycus. *Root* branching. *Frond* cylindrical. *Receptacles* cellular.

V. Fucus. *Root* scutate. *Frond* dichotomous. *Receptacles* small, filled with mucus, traversed by a network of jointed threads.

VI. Himanthalia. *Root* scutate. *Frond* cup-shaped. *Receptacles* very long, strap-shaped, dichotomously branched.

ORDER 2. SPOROCHNACEÆ. *Olive-coloured, inarticulate seaweeds, whose* spores *are attached to external, jointed filaments, which are either free, or compacted together into knob-like masses.*

* *Spores attached to pencilled filaments.*

VII. DESMARESTIA. *Frond* solid, distichous, filiform or flat.

VIII. ARTHROCLADIA. *Frond* filiform, nodose, traversed by a jointed tube.

** *Spores in knob-like receptacles.*

IX. SPOROCHNUS. *Receptacles* lateral, stalked.

X. CARPOMITRA. *Receptacles* terminal.

Order 3. LAMINARIACEÆ. *Olive-coloured, inarticulate seaweeds, whose* spores *are superficial, either forming cloud-like patches, or covering the whole surface of the frond.*

XI. ALARIA. Stipitate. *Stipes* ending in a midribbed leaf.

XII. LAMINARIA. Stipitate. *Stipes* ending in a ribless leaf.

XIII. CHORDA. *Frond* leafless, cylindrical, hollow; the cavity interrupted by transverse partitions.

Order 4. DICTYOTACEÆ. *Olive-coloured, inarticulate seaweeds, whose* spores *are superficial, disposed in definite spots or lines (sori).*

* *Root coated with woolly fibres; frond flat.*

XIV. CUTLERIA. *Frond* ribless, irregularly cleft. *Sori* dot-like, scattered. *Spores* pedicellate, containing numerous sporules.

XV. HALISERIS. *Frond* midribbed.

XVI. PADINA. *Frond* ribless, fan-shaped, concentrically striate. *Sori* linear, concentric, bursting through the epidermis.

XVII. ZONARIA. *Frond* ribless, lobed, concentrically striate. *Sori* roundish, containing spores and jointed threads.

XVIII. TAONIA. *Frond* ribless, irregularly cleft, somewhat fan-shaped. *Sori* linear, concentric, superficial, alternating with scattered spores.

XIX. DICTYOTA. *Frond* ribless, linear, dichotomous. *Sori* roundish, scattered, bursting through the epidermis: or, (on distinct plants) scattered spores.

** *Root a minute naked disc; frond cylindrical, branched.*

XX. STILOPHORA. *Spores* concealed among moniliform threads, which are collected into convex, wart-like *sori*.

XXI. DICTYOSIPHON. *Spores* irregularly scattered, solitary, or in dot-like *sori*, not accompanied by moniliform threads.

XXII. STRIARIA. *Spores* in dot-like *sori*, ranged in transverse lines.

**** Root naked; frond unbranched, cylindrical or flat.*

XXIII. PUNCTARIA. *Frond* flat, leaf-like.

XXIV. ASPEROCOCCUS. *Frond* membranaceous, tubular, either cylindrical or compressed. *Spores* in dot-like *sori*, mixed with a few jointed threads.

XXV. LITOSIPHON. *Frond* cartilaginous, filiform, subsolid. *Spores* scattered, sub-solitary.

Order 5. CHORDARIACEÆ. *Olive-coloured seaweeds, with a gelatinous or cartilaginous frond, composed of vertical and horizontal filaments interlaced together.*

** Frond cylindrical, branching.*

XXVI. CHORDARIA. *Axis* cartilaginous, dense; filaments of the circumference unbranched.

XXVII. MESOGLOIA. *Axis* gelatinous, loose; filaments of the circumference branching.

*** Frond either tuber-shaped, or crustaceous and spreading.*

XXVIII. LEATHESIA. *Frond* tuber-shaped.

XXIX. RALFSIA. *Frond* crustaceous.

**** Parasites, consisting of densely tufted filaments, connected at the base, free above.*

XXX. ELACHISTA. *Filaments* pencilled, rising from a tubercular base, composed of vertical fibres.

XXXI. MYRIONEMA. *Tufts* cushion-like; filaments rising from a flat base, composed of decumbent fibres.

Order 6. ECTOCARPACEÆ. *Olive-coloured, articulated, filiform seaweeds, whose* spores *are (generally) external, attached to the jointed ramuli.*

** Frond rigid; each articulation composed of numerous cells.*

XXXII. CLADOSTEPHUS. *Ramuli* whorled.

XXXIII. SPHACELARIA. *Ramuli* distichous, mostly pinnated.

*** Frond flaccid; each articulation formed of a single cell.*

XXXIV. ECTOCARPUS. *Frond* branching; ramuli scattered.

XXXV. MYRIOTRICHIA. *Frond* unbranched; ramuli whorled, and tipped with pellucid fibres.

Sub-class II. RHODOSPERMEÆ or CERAMIALES.

(Red* or Brown-red Seaweeds.)

Order 7. Rhodomelaceæ. *Red or brown-red seaweeds, with a leafy or filiform, areolated or articulated frond, composed of polygonal cells.* Fruit *double:* 1. Conceptacles (ceramidia) *external, ovate or urn-shaped, with a terminal pore, and containing a tuft of pear-shaped* spores: 2. Tetraspores *immersed in distorted ramuli, or contained in proper* receptacles (*called here* stichidia).

* *Frond flattened, pinnatifid.*

XXXVI. Odonthalia.

** *Frond filiform, wholly inarticulate.*

XXXVII. Rhodomela. *Branches* coated with minute, irregular cells. *Apices* not involute.

XXXVIII. Bostrychia. *Branches* dotted; the surface cells quadrate. *Apices* strongly involute.

XXXIX. Rytiphlœa. *Branches* transversely striate, at short distances.

*** *Frond filiform, partially or generally articulate.*

XL. Polysiphonia. *Articulations* of the ramuli two- or many-tubed. *Tetraspores* in distorted ramuli.

XLI. Dasya. *Articulations* of the ramuli single-tubed. *Tetraspores* in lanceolate pod-like receptacles (*Stichidia*).

Order 8. Laurenciaceæ. *Rose-red or purple seaweeds, with a cylindrical or compressed, rarely flat, linear, narrow, areolated, inarticulate, or constricted and chambered, branching frond, composed of polygonal cells.* Fruit *double:* 1. Conceptacles (ceramidia) *external, ovate, with a terminal pore, and containing a tuft of pear-shaped* spores: 2. Tetraspores *scattered without order among the surface cells of the branches and ramuli.*

* *Frond solid.*

XLII. Bonnemaisonia. Rose-red, excessively branched, distichous; ramuli subulate, acute.

XLIII. Laurencia. Purplish, yellowish, or reddish, pinnatifid or pinnate; ramuli obtuse.

** *Frond (at least the branches) hollow.*

XLIV. Chrysymenia. *Frond* neither constricted nor chambered.

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* See also *Ulvaceæ* and *Oscillatoriaceæ* among the Green Algæ.

XLV. CHYLOCLADIA. *Frond* (at least the branches) constricted at intervals and chambered.

Order 9. CORALLINACEÆ. *Rigid, articulated, or crustaceous, mostly calcareous seaweeds, purple when recent, fading on exposure to milk-white, composed of cells in which carbonate of lime is deposited in an organized form.* Tetraspores *tufted, contained in ovate or spherical* conceptacles (ceramidia) *furnished with a terminal pore.*

* *Frond filiform, articulated.*

XLVI. CORALLINA. *Frond* pinnated. *Ceramidia* terminal, simple.

XLVII. JANIA. *Frond* (in the Brit. species) dichotomous. *Ceramidia* tipped with two horn-like ramuli.

** *Frond crustaceous or foliaceous, not articulated.*

XLVIII. MELOBESIA. Opaque, stony; crustaceous, foliaceous, or shrubby.

XLIX.? HILDENBRANDTIA. Cartilaginous (not stony), incrusting rocks.

L.? HAPALIDIUM (*Kütz.*). Minute, crustaceo-membranaceous, hyaline, composed of a single stratum of cells radiating from a centre.

Order 10. DELESSERIACEÆ. *Rosy or purple-red or blood-red seaweeds, with a leafy, rarely filiform, areolated, inarticulate frond, composed of polygonal cells.* Leaves *delicately membranaceous.* Fructification *double:* 1. Conceptacles (coccidia) *external or half-immersed, hemispherical, usually imperforate, containing, beneath a membranous pericarp, a tuft of filaments, whose cells are finally changed into* spores. 2. Tetraspores *in distinctly defined* sori, *either scattered or confined to proper leaflets* (sporophylla).

LI. DELESSERIA. *Frond* leafy, of definite form, with a percurrent midrib.

LII. NITOPHYLLUM. *Frond* leafy, irregularly lobed, without midrib.

LIII. PLOCAMIUM. *Frond* linear, compressed, distichously much branched; ramuli pectinate, acute.

Order 11. RHODYMENIACEÆ. *Purplish or blood-red seaweeds, with an expanded or filiform, inarticulate frond, composed of polygonal cells; occasionally traversed by a fibroso-cellular axis.* Superficial cells *minute, irregularly packed, or (rarely) disposed in excentric filaments.* Fructification *double:* 1. Conceptacles (coccidia) *external or half-immersed, globose or hemispherical, imperforate, containing, beneath a thick peri-*

carp, a mass of spores, *on a central* placenta: 2. Tetraspores *either dispersed indefinitely, or forming cloud-like patches.*

* *Frond flat, leaf-like, dichotomous or palmate.*

LIV. ? STENOGRAMME. *Conceptacles* linear, rib-like. (*Sori* definite.)

LV. RHODYMENIA. *Conceptacles* hemispherical, scattered.

** *Frond compressed or terete, shrubby, much branched.*

LVI. SPHÆROCOCCUS. *Frond* linear, two-edged, distichous, traversed by an obscure midrib.

LVII. GRACILARIA. *Frond* filiform (rarely compressed or flat), irregularly branched; the central cells very large.

LVIII. HYPNEA. *Frond* filiform, irregularly branched, traversed by a fibro-cellular axis.

Order 12. CRYPTONEMIACEÆ. *Purplish or rose-red seaweeds, with a filiform or (rarely) expanded, gelatinous or cartilaginous frond, composed, wholly or in part, of cylindrical cells, connected together into threads or filaments.* Axis *formed of vertical,* periphery *of horizontally excentric filaments.* Fructification *double:* 1. Conceptacles (favellidia) *globose masses of* spores *immersed in the frond, or in swellings of the branches:* 2. Tetraspores *variously dispersed.*

Sub-order 1. COCCOCARPEÆ. Frond *solid, dense, cartilaginous or horny.* Favellidia *in semi-external* tubercles *or swellings of the frond.*

LIX. GRATELOUPIA. Pinnated, flat, membranaceo-cartilaginous, of very dense structure. *Favellidia* with a pore. *Tetraspores* scattered.

LX. GELIDIUM. Pinnated, compressed, horny, of very dense structure. *Favellidia* in swollen ramuli, imperforate. *Tetraspores* in sori.

LXI. GIGARTINA. *Frond* variously branched, cartilaginous; its flesh composed of anastomosing filaments, lying apart in firm gelatine. *Favellidia* in external *tubercles. Tetraspores* contained in dense, immersed *sori.*

Sub-order 2. SPONGIOCARPEÆ. Frond *solid, dense, cartilaginous or horny.* Favellidia (*of several*) *imperfectly known.* Wart-like swellings (*or* nemathecia) *composed of filaments, sometimes changed into* tetraspores; *sometimes into* spores.

LXII. CHONDRUS. *Frond* flabelliform, dichotomously cleft,

cartilaginous; of very dense structure. *Tetraspores* in definite, immersed *sori*.

LXIII. PHYLLOPHORA. *Frond* stipitate, rigid-membranaceous, proliferous; of very dense structure. *Tetraspores* in superficial sori, or in proper leaflets.

LXIV. PEYSSONNELIA. *Frond* depressed, expanded, rooting by the under surface, concentrically zoned. *Tetraspores* contained in superficial warts.

LXV. GYMNOGONGRUS. *Frond* filiform, dichotomous, horny, of very dense structure. *Tetraspores* in superficial warts.

LXVI. POLYIDES. *Root* scutate. *Frond* cylindrical, dichotomous, cartilaginous. *Favellæ* contained in external, spongy warts. *Tetraspores* cruciate, immersed in the branches.

LXVII. FURCELLARIA. *Root* branching. *Frond* cylindrical, dichotomous, cartilaginous. *Favellæ* immersed in the pod-like swollen extremities of the branches. *Tetraspores* similarly immersed, transversely zoned.

Sub-order 3. GASTROCARPEÆ. Frond *gelatinoso-membranaceous or fleshy, hollow, or of lax texture within.* Favellidia *immersed in the central substance of the frond, very numerous.*

LXVIII. DUMONTIA. *Frond* cylindrical, tubular. *Favellidia* immersed in the wall of the frond. *Tetraspores* also immersed, cruciate.

LXIX. HALYMENIA. *Frond* compressed or flat, gelatinoso-membranaceous, the membranous surfaces connected by a few slender, anastomosing filaments. *Favellidia* attached to the inner face of the wall.

LXX. GINANNIA. *Frond* cylindrical, distended, traversed by a fibrous axis; the walls membranaceous, connected with the axis by horizontal filaments. *Favellidia* attached to the walls.

LXXI. KALLYMENIA. *Frond* expanded, leaf-like, carnoso-membranous, solid, of dense structure. *Favellidia* pimply, half-immersed in the frond, and scattered over its surface.

LXXII. IRIDÆA. *Frond* expanded, leaf-like, thick, carnoso-coriaceous, solid, of dense structure. *Favellidia* wholly immersed.

LXXIII. CATENELLA. *Frond* tubular, branched, constricted at intervals into oblong pseudo-articulations; the tube traversed by a few filaments.

Sub-order 4. GLOIOCLADIEÆ. Frond *loosely gelatinous; the filaments of which it is composed lying apart from one another, surrounded by a copious gelatine.* Favellidia *immersed.*

LXXIV. CRUORIA. *Frond* crustaceous, skin-like.

LXXV. NACCARIA. *Frond* filiform, solid, cellular; the ramuli (only) composed of radiating, free filaments.

LXXVI. GLOIOSIPHONIA. *Frond* tubular; the walls composed of radiating filaments.

LXXVII. NEMALEON. *Frond* filiform, solid, elastic; the *axis* composed of closely packed, vertical filaments; the periphery of moniliform, free, horizontal filaments.

LXXVIII. DUDRESNAIA. *Frond* filiform, solid, gelatinous; the axis composed of a network of anastomosing vertical filaments; the periphery of moniliform, free, horizontal filaments.

LXXIX. CROUANIA. *Frond* filiform, consisting of a jointed filament (*axis*), whorled at the joints with minute, multifid, moniliform, free, horizontal filaments (or ramelli).

Order 13. CERAMIACEÆ. *Rose-red or purple seaweeds, with a filiform frond, consisting of an articulated, branching filament, composed of a single string of cylindrical cells, sometimes coated with a stratum of smaller polygonal cells.* Fructification *double:* 1. Favellæ, *berry-like receptacles, with a membranous coat, containing numerous angular* spores: 2. Tetraspores, *attached to the ramuli, or subimmersed in their substance, scattered.*

LXXX. PTILOTA. *Frond* compressed, inarticulate, distichous, pectinato-pinnate. *Favellæ* stalked, involucrate.

LXXXI. MICROCLADIA. *Frond* filiform, inarticulate, dichotomous. *Favellæ* sessile, involucrate.

LXXXII. CERAMIUM. *Frond* filiform, articulate, dichotomous; the nodes opaque. *Favellæ* sessile, mostly involucrate. *Tetraspores* immersed or subimmersed.

LXXXIII. SPYRIDIA. *Frond* filiform, inarticulate; the branches clothed with minute, setiform, articulated ramelli. *Favellæ* stalked, involucrate. *Tetraspores* sessile on the ramelli.

LXXXIV. GRIFFITHSIA. *Frond* articulated, dichotomous, or clothed with whorled, dichotomous ramelli. *Favellæ* involucrated, sessile, or stalked. *Tetraspores* sessile on whorled ramelli.

LXXXV. WRANGELIA. *Frond* articulated, pinnate. *Fu-*

vellæ terminal, involucrated, containing tufts of pear-shaped spores. *Tetraspores* sessile, scattered.

LXXXVI. SEIROSPORA. *Frond* articulated. *Tetraspores* disposed in terminal, moniliform strings.

LXXXVII. CALLITHAMNION. *Frond* (at least the branches and ramuli) articulate, mostly pinnate. *Favellæ* terminal or lateral, sessile, without involucre (except in *C. Turneri*). *Tetraspores* sessile or pedicellate, scattered.

SUB-CLASS III. CHLOROSPERMEÆ OR CONFERVALES.

(Grass-green* Seaweeds.)

Order 14. SIPHONACEÆ. *Green, marine or fresh-water Algæ, composed of continuous, tubular, simple or branched filaments (elongated cylindrical cells), free, or variously combined in cylindrical or expanded fronds.*

LXXXVIII. CODIUM. *Filaments* combined into a spongy frond.

LXXXIX. BRYOPSIS. *Filaments* free, pinnated.

XC. VAUCHERIA. *Filaments* free, dichotomous or irregular.

Order 15. CONFERVACEÆ. *Green, marine or fresh-water Algæ, composed of articulated filaments, simple or branched, free or invested by gelatine. Cells cylindrical, truncate.*

Sub-order 1. CONFERVEÆ. *Filaments free, destitute of gelatine.*

XCI. CLADOPHORA. *Filaments* tufted, branched.

XCII. RHIZOCLONIUM. *Filaments* decumbent, subsimple, emitting a few root-like branches.

XCIII. CONFERVA. *Filaments* unbranched.

Sub-order 2. CHÆTOPHOREÆ. *Filaments united in submembranaceous or gelatinous fronds; cells often tipped with bristles.* Sporangia *external.*

XCIV. OCHLOCHÆTE. *Frond* disciform. *Filaments* radiating from a central point, prostrate, irregularly branched; each cell produced above into a rigid, inarticulate bristle.

Order 16. ULVACEÆ. *Green, or rarely purple, marine or fresh-water Algæ, composed of small polygonal cells, forming expanded membranes, or membranous tubes; very rarely arranged in filaments.*

XCV. ENTEROMORPHA. *Frond* tubular.

* A few *Ulvaceæ* and *Oscillatoriaceæ* are purple.

XCVI. Ulva. *Frond* flat, green.
XCVII. Porphyra. *Frond* flat, purple.
XCVIII. Bangia. *Frond* filiform (mostly), purple or pink.

Order 17. Oscillatoriaceæ. *Green or blue, rarely purple, marine or (more frequently) fresh-water Algæ, composed of continuous, tubular, simple, or rarely branching filaments, which are either free or invested with gelatine.* Endochrome *annulated, at length separating into lenticular* sporidia.

Sub-order 1. Rivulariæ. *Filaments united together into a solid gelatinous or cartilaginous frond.*

XCIX. Rivularia. *Filaments* not sheathed.
C. Schizosiphon. *Filaments* sheathed; the sheath multifid.

Sub-order 2. Oscillatoriæ. *Filaments tufted or stratified, free.*

CI. Schizothrix. *Filaments* rigid, in branching bundles, at length splitting.
CII. Calothrix. *Filaments* short, tufted, fixed at the base only.
CIII. Lyngbya. *Filaments* elongate, decumbent, flaccid.
CIV. Microcoleus. *Filaments* needle-shaped, several enclosed together in membranous or gelatinous sheaths.
CV. Oscillatoria. *Filaments* needle-shaped, straight or slightly curved, short, heaped together in gelatinous strata, oscillating.
CVI. Spirulina. *Filaments* spirally twisted, lying in a mucous stratum, vividly oscillating.

Order 18. Nostochaceæ. *Green, fresh-water or rarely marine Algæ, composed of moniliform filaments, lying in a gelatinous matrix. Cells globose or oval.*

CVII. Monormia. A single filament enclosed in a convoluted gelatinous and branching frond.
CVIII. Sphærozyga. *Filaments* free, separate, naked.
CIX. Spermosira. *Filaments* free, separate; each enclosed in a very delicate, membranous, filiform tube.

Order 19. Palmellaceæ.

Sub-order Hormosporeæ. Cells *contained in confervoid, simple or branching, tubular filaments.*

CX. Hormospora.

SPECIES.

Sub-class I. MELANOSPERMEÆ.

Order 1. *FUCACEÆ*.

I. SARGASSUM.

1. **vulgare** (*The common Sargassum*); stem filiform, smooth, alternately branched; leaves linear-lanceolate or oblong-lanceolate (very variable in breadth), serrated, strongly ribbed, copiously glandular; air-vessels on compressed stalks about their own length, spherical, pointless; receptacles axillary, dichotomous, tuberculose, unarmed, *Ag. Sp. Alg. v.* 1. *p.* 3. (Atlas, Pl. I. Fig. 1.)

Fucus natans (in part), *Turn. t.* 2114.

Hab. Atlantic Ocean, abundant on the tropical and subtropical coasts. Cast on the British coasts, drifted by oceanic currents from warmer latitudes.

One of the stray waifs of tropical climes, which are occasionally brought to our shores by the great north-eastern current of the Atlantic, and which have no proper claim to admission into our Flora. Though the present species has had a place in British works for nearly a century, I have never seen a (so-called) British specimen, and have made my figure from an American example.

2. **bacciferum** (*The berry-bearing Sargassum*); stem cylindrical, slender, much branched, flexuous; leaves linear, serrated, mostly without muciferous pores; air-vessels abundant, spherical, on cylindrical stalks, commonly mucronate, *Ag. Sp. Alg. v.* 1. *p.* 6. (Atlas, Pl. I. Fig. 2.)

Fucus bacciferum, *Turn.* F. natans, *Esper.* F. sargasso, *Gmel.*

Hab. Tropical and subtropical ocean, throughout both hemispheres, always found floating on the surface of the sea. Occasionally cast on the British coasts, but not a native of our waters.

This plant, the well-known *Sargasso* or Gulf-weed, has

clearly no claims to be admitted to the British Flora, but having already been introduced into other works, I figure it, though obliged to take my drawing from a foreign specimen. The branch shown in the figure is part of a specimen picked up at sea, in the great floating bank of Gulf-weed which extends at the westward of the Azores from the twentieth to the thirty-sixth degree of north latitude. *Sargassum bacciferum* is found in ridges from ten to twenty yards wide, and of indefinite length, stretching across the sea. In this situation it continues to grow luxuriantly, and appears to multiply itself by offsets, at first accidentally broken off, and immediately establishing themselves as independent plants. A great variety of marine animals, from Crustacea downwards, inhabit its branches, but I have observed no parasitical Algæ on any of the specimens picked up. The list of animal species would afford subject for a small volume, but very few of them are of a strictly parasitical nature.

II. HALIDRYS.

3. **siliquosa** (*The podded Halidrys*); branches linear, very narrow; air-vessels compressed, linear-lanceolate, slightly constricted at the septa, mucronate, *Lyngb. Hyd. D. p.* 37. (Atlas, Pl. I. Fig. 3.)

Cystoseira siliquosa, *Ag.* Fucus siliquosus, *Linn.* F. siliculosus, *Stack.*

Hab. Common on the shores of the British Islands. On rocks and stones in the sea, at and below half-tide level. Perennial. Winter and spring.

One of the handsomest of British *Fucaceæ*, and common on all our shores. It is subject to little variation, except in size. When growing in shallow water, or in tide-pools near high-water mark, it becomes stunted in its habits, having the branches more closely set, and bushy, and every part proportionally smaller and narrower. This state constitutes the var. β of authors. The genus *Halidrys*, founded by Lyngbye, is well distinguished from all other *Fucaceæ* by the curious structure of its air-vessels. These compound air-vessels are confined to the present individual, and to the beautiful *Fucus osmundaceus* of Turner, a native of the west coast of North America. In this latter species the structure is slightly different, and the vesicles are much constricted at the joints, like strings of beads. The whole

habit, however, is so very similar to that of our *H. siliquosa*, that I cannot but consider it as properly a member of the same natural genus.

III. CYSTOSEIRA.

4. **ericoides** (*The Heath-like Cystoseira*); stem thick, woody, short, cylindrical, beset with numerous, slender, filiform branches, variously divided, and densely clothed with small, spine-like, awl-shaped ramuli; air-vessels small, solitary beneath the apices of the branches; receptacles cylindrical, armed with awl-shaped processes, *Ag. Sp. Alg. v.* 1. *p.* 52. (Atlas, Pl. I. Fig. 4.)

Halerica ericoides, *Kütz.* Fucus ericoides, *Sp.* F. tamariscifolius, *Huds.* F. selaginoides, *Esper.*

Hab. Frequent on the shores of the south of England and south and west of Ireland. On marine rocks near low-water mark, and in tide-pools. Perennial. Summer and autumn.

This is one of the most beautiful of the British species of *Cystoseira*, especially when seen growing under water. It then appears clothed with the richest tints of blue and green, more like those phosphorescent gleams that flash from the lower marine animals than any vegetable colours. As each twig waves to and fro in the water the hues vary, and sometimes, when the light falls partially on a branch, some portions seem covered with sky-blue flowers, while others remain dark. All these beautiful tints perish when the plant is removed from the water. The specific name *ericoides*, or Heath-like, alludes both to the brilliant colouring and to the shrubby character of the frond, which is covered with small ramuli resembling the leaves of a Heath.

5. **granulata** (*The granulated Cystoseira*); stem cylindrical, covered with elliptical knobs, each of which bears a slender, repeatedly divided, dichotomo-pinnate, filiform branch, irregularly set with scattered, awl-shaped, thorn-like ramuli; air-vessels small, two or three together in the upper part of the branches; receptacles elongated, *Ag. Sp. Alg. v.* 1. *p.* 55. (Atlas, Pl. II. Fig. 5.)

Fucus granulatus, *Lin.* F. concatenatus, *Lin.* F. mucronatus, *Turn.* F. nodicaulis, *With.* Phyllacantha Boryana (?), *Ktz.*

Hab. In rocky basins left by the tide, at and below half-tide level. Perennial. Summer.

From the other British species of *Cystoseira*, except from *C. barbata*, which has probably no claim to be admitted as British, *C. granulata* may be readily known by the knob-

like bases of its branches, a character at all times obvious. Like its congeners it is exceedingly bushy, forming a submarine shrub whose branches are closely crowded together on the short, thick stem, and spread in all directions in a dense head. *C. granulata* is of frequent occurrence on the shores of England and Ireland, but appears to be rare in Scotland. It generally grows in a very scattered manner, but is sometimes gregarious. Its copiously branched stems afford a grateful resting-place to a host of marine animals, sponges, etc., and are often completely clothed with a thick incrustation of animal life. However annoying this may be to the collector of specimens, who can rarely, if ever, find a clean-stemmed *Cystoseira*, it must be admitted that these parasites add much to the picturesque beauty of a *Cystoseira*-grove, their brilliant colours and starry forms looking like clusters of flowers peeping out from the branches. When seen, under a favourable light, in a clear tide-basin, the effect is highly beautiful.

6. **barbata** (*The bearded Cystoseira*); stem cylindrical, covered with small, elliptical knobs, each of which bears a very slender, many times dichotomo-pinnated, filiform branch; air-vessels lanceolate, one or two together; receptacles small, elliptic-oblong, mucronate, *Ag. Sp. Alg. v.* 1. *p.* 57. (Atlas, Pl. II. Fig. 8.)

Fucus barbatus, *Good. et Woodw.* F. fœniculaceus, *Gm.*

Hab. On rocks between tide-marks. It is said to have been gathered by Hudson in Devonshire; but has not been recently found.

The figure here given has been prepared chiefly from a specimen collected at Catania in Sicily, and given me, many years ago, by Professor Gussone. I have seen no British specimen, nor am I aware that any authentic evidence is on record of the finding of this plant on the British coast, although it is mentioned as an undoubted native of Devonshire by Hudson, Stackhouse, and other early writers on these plants. Turner says, "How far *F. barbatus* is really entitled to a place in the British Flora I own I entertain much doubt. I never saw a specimen gathered on our shores; and in Devonshire, where Hudson is stated to have gathered it, I have been fortunate enough to enjoy the advantage of correspondents, who would have been little likely to have left it unnoticed." This was written upwards of thirty years ago, since which

time no part of England has been more zealously or more successfully explored, by a multitude of skilful observers, than the coasts of Devonshire and Cornwall, but no one has met with a scrap of this plant; wherefore I fear it is but too evident that it has no claim to a place in our list.

7. **fœniculacea** (*The Fennel-leaved Cystoseira*); stem compressed; branches long, slender, rough with hard points, repeatedly dichotomo-pinnate; air-vessels small, solitary or two together, elliptical oblong, placed near the tips of the branches; receptacles minute, smooth, linear-lanceolate, *Grev. Alg. Br. p.* 6. (Atlas, Pl. II. Fig. 7.)

Cystoseira discors, *Ag.* C. abrotanifolia, *Ag.* Fucus fœniculaceus, *Linn.* F. discors, *Linn.* F. abrotanifolius, *Linn.*

Hab. Atlantic shores of England. Growing on rocks, in tide-pools, near low-water mark. Perennial. Summer.

I follow Turner, and all succeeding British writers, in uniting, under the common name *fœniculacea*, the *Fucus discors* and *F. abrotanifolius* of Linnæus, which Continental authorities, without exception, retain in the rank of species. Mrs. Griffiths, on the accuracy of whose observations made during many years' familiarity with this species I place implicit reliance, states that such specimens as grow in deep water, where they are seldom or never exposed by the tides, constitute the *F. discors* of authors, especially if collected in summer, at which season they are extremely luxuriant, with broad leaves and large air-bladders; and that fronds which are developed in shallow tide-pools, or collected late in autumn or winter, being more branched, and having narrower leaves, make the *F. abrotanifolius*. On the depth of water, or difference of season, therefore, depend all the characters on which it has been attempted to erect two species.

8. **fibrosa** (*The fibrous Cystoseira*); stem woody, compressed, very much branched; branches slender, alternately bi-tri-pinnate; pinnules furnished with linear, setaceous, acute ramuli; vesicles elliptical, solitary or in pairs, immersed in the smaller branches, remote from the apices; receptacles linear, very long, more or less clothed with setaceous ramuli, *Ag. Sp. Alg. v.* 1. *p.* 65. (Atlas, Pl. II. Fig. 6.)

Phyllacantha fibrosa, *Kütz.* Fucus fibrosus, *Huds.* F. abrotanoides, *Gmel.* F. baccatus, *Gmel.* F. setaceus, *Hud.*

Hab. Frequent on the shores of England and of the north, west,

and south of Ireland. On rocks, near low-water mark and in tide-pools; also in 4–15 fathoms water. Perennial. Summer.

This is the largest and finest of the British *Cystoseiræ*, and when grown under circumstances favourable to its full development, it is a very handsome plant. From *C. ericoides*, with which only among British species it can be confounded, *C. fibrosa* may always be known by its more slender branches, the large size of its air-vessels, and the very long, filiform receptacles clothed with setaceous ramuli; nor does it exhibit, when growing, those brilliant rainbow-tints for which *C. ericoides* is so remarkable. It is by no means so commonly clothed with animal parasites as our other species, but is frequently infested with *Elachista flaccida*, a plant which I believe to be peculiar to it.

IV. PYCNOPHYCUS.

9. **tuberculatus** (*The tubercled Pycnophycus*); root composed of branching fibres; frond cylindrical, dichotomous; air-vessels, when present, innate, simple; receptacles terminal, cellular, pierced by numerous pores, which communicate with immersed, spherical conceptacles, containing, in the lower part of the receptacles, parietal, simple spores, and in the upper, tufted antheridia, *Kützing*, *Phyc. Gen. p.* 359. (Atlas, Pl. III. Fig. 9.)

Cymaduse tuberculata, *Dne.* Fucus tuberculatus, *Huds.* F. bifurcatus, *With.*

Hab. In rock-pools left, on the recess of the tide, near low-water mark; never growing in places which are dry at low-water. Perennial. Summer and autumn.

There is something so peculiar in the habit of this species, so different from that of the other members of the restricted genus *Fucus*, that it seems, even at first sight, to have claims to be regarded as belonging to another genus. Its branching root and cylindrical frond are very obvious distinctions, but they are not the only ones. When we come to examine its receptacles more closely, we find that not merely are they (so to speak) *monœcious*, each receptacle containing the two kinds of conceptacles, while in *Fucus* they are *diœcious;* but their cellular structure is widely different, those of the present individuals agreeing much more nearly with the receptacles of *Halidrys*, than of *Fucus proper;* and it is next to *Halidrys* that Kützing has very properly placed it in his arrangement.

V. FUCUS.

10. **vesiculosus** (*The twin-bladdered Fucus*); frond flat, coriaceous, thick, linear, dichotomous, quite entire at the margin, midribbed; air-vessels globose or elliptical, mostly in pairs (often absent); receptacles turgid, elliptical, ovate, or lanceolate, terminal, *Linn. Sp. Pl. p.* 1626. (Atlas, Pl. III. Fig. 10.)

Fucus divaricatus, *Linn.* F. inflatus, *Linn.* F. spiralis, *Linn.* F. volubilis, *Huds.* F. Sherardi, *Stack.* F. linearis, *Huds.* F. distichus, *Lightf.* F. Balticus, *Ag.*

Hab. On rocks and stones left exposed at low water; also on artificial piers and quays in estuaries, extending up rivers as long as the water remains sensibly brackish. Perennial. Summer and winter. Very abundant.

The commonest and one of the most widely-diffused species of the restricted genus *Fucus*. It abounds along the shores of the Northern Atlantic, extending even to the tropics, and is said to have been found in the southern portion of that ocean, but the southern localities want confirmation. In the Pacific, it has been collected on the north-west coast of America. As may be judged by the numerous synonyms, this is rather a variable plant, but the variations may be summed up in a few words. The first and most obvious is in size; some specimens, fully grown and in fruit, being not an inch in length, while others extend to several feet. The dwarfish individuals, constituting our var. β, grow in brackish water and in muddy places. Other varieties are destitute of air-vessels, or have the air-vessels of a lengthened figure; and others vary in the shape of the fructification, the receptacle being sometimes globose, sometimes ellipsoidal, and sometimes spindle-shaped. Lastly, the frond is frequently spirally twisted. On characters such as these, the *eight* book-species, quoted as synonyms, have been constituted. *Fucus vesiculosus* is largely used in the manufacture of kelp; and also yields *mannite* in considerable quantity. In the north of Europe, when the vegetation of the land ceases, or is covered with snow, it furnishes an abundant winter fodder for cattle, which regularly visit the shores, at the retreat of the tide, in search of it. Various are the uses to which the Icelanders and Greenlanders apply it, as Linnæus and others inform us.

11. **ceranoides** (*The horn-like Fucus*); frond plane, coriaceo-membranaceous, linear, subdichotomous, entire at the margin, midribbed, without vesicles; lateral branches narrower

than the frond, repeatedly forked, level-topped, bearing fruit in their apices; receptacles spindle-shaped or bifid, acute, *Linn. Sp. Pl. p.* 1626. (ATLAS, Pl. III. Fig. 11.)

Fucus distichus, *Esper.*

Hab. On rocks and stones between tide-marks; seldom, except in places where fresh-water streams enter the sea; often in land-locked bays, and estuaries. Perennial. Spring and summer.

This species, in many respects, resembles *F. vesiculosus*, with some varieties of which it has been occasionally confounded; but it has many characters by which it may at all times be known, independently of the absence of vesicles,—which character is too variable to be depended on, for in many forms of *F. vesiculosus* vesicles are wanting. *F. ceranoides* may be readily known by its much thinner and more transparent substance, and by containing a less quantity of saline matters; so that it dries much more rapidly when removed from the water, and requires far less steeping in fresh water when specimens are prepared for the Herbarium. The usual habitat of this species is in places where a good deal of fresh water mixes with the sea; but it is by no means confined to such places. In the Loch of Stennis, Orkney, where the water is but faintly brackish, a very narrow variety is abundant. The greater the amount of saltness in the water the broader is the frond, but in no case is the substance so thick and leathery as in *F. vesiculosus*.

12. **serratus** (*The serrated Fucus*); frond plane, dichotomous, midribbed, serrated, without air-vessels; receptacles flat, terminating the branches, serrated, *Linn. Sp. Pl. p.* 1626. (ATLAS, Pl. III. Fig. 12.)

Hab. On rocky sea-shores, clothing the rocks at half-tide level. Perennial. Winter and spring. Very common.

Fucus serratus abounds on all the Atlantic shores of Europe, and occurs, though rarely, on the eastern shores of America, but is not found, according to J. Agardh, in the Mediterranean. It presents some varieties, chiefly distinguished by the greater or less breadth of the frond, and the depth of the serratures. I have chosen one of the most common states for illustration. In the variety *integerrimus* of Turner the marginal serratures are very shallow and sometimes obsolete, but always sufficiently marked to prevent the species being mistaken. In his variety *latifolius*, the upper branches are very much wider than the

lower, sometimes more than two inches broad, and remarkably rounded, not unlike the webbed feet of some waterfowl; and in Greville's variety *laciniatus* the serratures are very deeply cut, "and cleft or laciniate."

13. **nodosus** (*The knobbed Fucus*); frond compressed, without distinct rib, leathery, subdichotomous; branches strap-shaped, somewhat pinnated, attenuate at base, remotely toothed, here and there swelling into oblong air-vessels; receptacles lateral, ovate, stalked, springing from the axils of the marginal teeth, *Linn. Sp. Pl. p.* 1628. (Atlas, Pl. IV. Fig. 13.)

Halidrys nodosa, *Lyngb.* Physocaulon nodosum, *Kütz.* Ozothallia vulgaris, *Dne.*

Hab. Growing on submarine rocks and large boulder stones, from ordinary high-water mark to half-tide level. Perennial. Winter and spring. Very common.

This is the largest of the British species of the restricted genus *Fucus*, and by far the toughest and most rigid. Its substance is thicker and denser than that of any of the others, and its frequently pinnated habit, and remarkably large vesicles, added to the ribless frond, afford strong marks of distinction. When in fructification, the great abundance of the clear yellow receptacles contrasts agreeably with the colour of the other parts of the frond. Like most other submersed plants, this varies in luxuriance according to the depth at which it grows: specimens near high-water mark being short and bushy, often exceedingly crowded in branches, and thickly covered with fruit; while those produced near ordinary low-water are drawn out to a great length, with more distant branches.

14. **Mackaii** (*Mackay's Fucus*); frond cylindrical or subcompressed, slender, much branched; branches dichotomous; air-vessels elliptical, solitary; receptacles lateral, lanceolate, ovate, or forked, stalked, pendulous, scattered, near the base of the branches, *Turn. Hist. t.* 52. (Atlas, Pl. IV. Fig. 14.)

Fucus nodosus, γ. Mackaii, *Ag.* Physocaulon Mackaii, *Kütz.*

Hab. Sea-shores, usually in land-locked bays, and among boulders. Perennial. April and May.

Fucus Mackaii was discovered in the year 1805, on the western coast of Ireland, by Dr. James Townsend Mackay, author of the 'Flora Hibernica,' in honour of whom the species has been named by Mr. Dawson Turner in his great work, the 'Historia Fucorum.' For a long time the fructification remained undiscovered, and, consequently, a doubt

rested on the validity of the species, the resemblance, in many respects, to a dwarfed variety of *Fucus nodosus* suggesting a probability that it was only a form of that plant. No doubt the connection between these plants is very strong, yet the difference in ramification is so great, and the constancy of character observed in *Fucus Mackaii* in many widely distant localities in which it has been abundantly found, is so remarkable, that added now to distinctions afforded by the position of the fruit, its characters are better established. Still, its habitat is anomalous, and it may be urged that the peculiar characters originate in this habitat. The *Fuci* in general are attached by scutate roots to rocks and stones; *Fucus Mackaii* invariably lies unattached, resting in its place, by its own weight, on mud, gravel, or among loose boulders. In such situations it flourishes from year to year, and fruits abundantly. The pendulous receptacles have a very pretty effect.

15. **canaliculatus** (*The channelled Fucus*); frond linear, narrow, channelled on one side, without midrib or air-vessels, dichotomous; receptacles terminal, bipartite, *Linn. Syst. Nat. v.* 2. *p.* 716. (Altas, Pl. IV. Fig. 15.)

Fucus excisus, *Linn.* Pelvetia canaliculata, *Dne.* Fucodium canaliculatum, *J. Ag.*

Hab. On rocky sea-shores, between high-water mark and half-tide level. Perennial. Summer and autumn.

This species begins to vegetate on the very edge of high-water mark, often in places where it is only wet by the spray. In such situations it attains a dwarfish size, seldom reaching more than an inch or two in height, but the specimens sometimes arrive at maturity and produce fruit. Between this, its extreme limit, and the level of half-tide, the main crop is developed, the fronds attaining a greater size with the increasing depth of water; but beyond half-tide we rarely, if ever, meet with *Fucus canaliculatus*. It evidently requires, by its organization, exposure to the atmosphere for a considerable period each day. Unlike most of its congeners, it rarely covers wide spaces of rock, but more commonly grows in scattered tufts in places where, on the recess of the tide, the water rapidly drains off.

VI. HIMANTHALIA.

16. **lorea** (*The leather-thong Himanthalia*); frond top-shaped,

at length cup-shaped, stalked; receptacles repeatedly dichotomous, tapering more or less at the apex, *Lyngb. Hyd. Dan. p.* 36. *t.* 8. (ATLAS, Pl. IV. Fig. 16.)

Fucus loreus, *Linn.* F. elongatus, *Linn.*

Hab. On rocky sea-shores, near low-water mark. Annual? Winter and spring. Common.

This well-known plant is very common on most of the rocky Atlantic coasts of Europe and North America. Authors are at variance as to its duration; Turner and Carmichael asserting that it is a *perennial;* Greville and Mrs. Griffiths that it is *annual.* It appears however to reach its full growth within the year, and vast multitudes of fronds then decay, while their receptacles are detached, and drift ashore in tangled strata. Possibly some survive to a second season, and throw out new receptacles (for I am unwilling to set aside the evidence of so trustworthy an observer as the late Captain Carmichael): but I have repeatedly and in vain sought for instances of this second growth, and am therefore disposed to regard the species as being, under common circumstances, an annual,—granting that it may occasionally be biennial from the influence of local causes. The common name is Sea-thongs, of which the lengthy Greek by which it is known to botanists is nearly a literal translation. It is used in the manufacture of kelp, in which salt it is said to be rich, though inferior in this respect to some of the true *Fuci.*

ORDER 2. *SPOROCHNACEÆ.*

VII. DESMARESTIA.

17. **ligulata** (*The tapering Desmarestia*); frond flat, with an obscure midrib, repeatedly pinnate; pinnæ and pinnulæ opposite, linear-lanceolate, tapering towards both extremities, *Lamour. Ess. p.* 25. (ATLAS, Pl. V. Fig. 17.)

Desmia ligulata, *Lyngb.* Sporochnus ligulatus, *Ag.* Laminaria ligulata, *Hook.* Fucus ligulatus, *Lightf.* F. herbaceus, *Huds.*

Hab. On the rocky bottoms of submarine tide-pools, near low-water mark; and at a greater depth. Annual. Summer. Not uncommon.

A very elegant plant, one of the most beautiful of our olive-coloured Algæ, and not uncommon on any of the British shores. It was first described by Lightfoot in his 'Flora Scotica,' where an excellent figure is also given. With a perfect regularity in its branching, and in all the

lesser details of its habit, there is so much difference in the relative breadth of the frond, that specimens from different parts of the coast have a very opposite aspect. In some the branches are broader than our larger figure represents, and these approach the narrower forms of the exotic *D. herbacea*, whose broader varieties have branches as wide as the laciniæ of a *Laminaria;* in others the frond is so narrow, that, as Mr. Turner well observes, such individuals may, at first sight, be mistaken for luxuriant fronds of *D. viridis*, whose narrower varieties are as delicate as the finest *Confervæ*. *D. ligulata* is widely distributed in the Northern Atlantic, and probably as common on the American as the European side, though we have as yet no evidence of the fact. In the southern hemisphere I am only aware of its having been found at Cape Horn, where Dr. J. D. Hooker dredged specimens from a considerable depth.

18. **aculeata** (*The prickly Desmarestia*); stem short, cylindrical, bearing numerous slender, elongate, flattish, irregularly bi-tri-pinnate branches; pinnæ and pinnulæ alternate, tapering at the base, filiform, either fringed with opposite tufts of bright green fibres, or margined with erect, awl-shaped, alternate, distichous spines, *Lam. Ess. p.* 25. (Atlas, Pl. V. Fig. 18.)

Desmia aculeata, *Lyngb.* Sporochnus aculeatus, *Ag.* Fucus aculeatus, *Linn.* F. muscoides, *Linn.*

Hab. On rocks and stones in the sea, near low-water mark, and at a greater depth. Perennial. Common on the shores of the British Islands.

At different stages of its growth this plant presents such opposite appearances, that a young botanist may readily mistake for two species, forms which depend entirely on age, and which have deceived even Linnæus himself. When young, the whole frond is of a tender substance, bright-green colour, and beautifully fringed with filaments; when old, it is coarse, brown, naked, and thorny. In plants of the second year, such as our figure represents, these characters are often found combined in the same specimen, in which the older parts of the frond are naked and spiny, the younger shoots being green and clothed with pencilled filaments. No fructification has yet been observed on this or any other species of *Desmarestia*.

19. **viridis**. (*The green Desmarestia*); frond cylindrical, filiform,

repeatedly pinnate; pinnæ and pinnulæ capillary, exactly opposite, patent, *Lamour. Ess. p.* 25. (ATLAS, Pl. V. Fig. 19.)
Dichloria viridis, *Grev.* Sporochnus viridis, *Ag.* Chordaria viridis, *Ag.* Gigartina viridis, *Lyngb.* Fucus viridis, *Esper.*
Hab. In the sea, growing on stones and the larger Algæ between tide-marks, and below low-water mark. Annual. Spring and early summer. Not uncommon.

There is no British Alga with which this can well be confounded. The delicacy of its capillary ramuli, the exact opposition of all its parts, from the primary branches to the most minute of the decompound ramuli, and the versatile colour, are all marks which peculiarly belong to *Desmarestia viridis*. Old and weather-beaten fronds, which have lost the more delicate ramuli, have something the aspect of *Dictyosiphon fœniculaceus*, but may be distinguished by the opposite branching. In the Atlas is represented one of the growing points of the young frond, magnified, showing the gradual coating of the confervoid framework (or *skeleton*) of the frond. The younger portions consist of a simple string of cells, or *articulated filament*, and in the lower part these cells are coated by a stratum of much smaller cellules. As the growth proceeds, these external coats are increased, while the original central *skeleton* may still be traced, in the branches, and even in the stem. *D. viridis* is very widely dispersed through the colder zones, and increases in luxuriance as it approaches either pole.

VIII. ARTHROCLADIA.

20. **villosa** (*The hairy Arthrocladia*); frond filiform, cellular, with an articulated, tubular axis, nodose; the nodes producing whorls of delicate, jointed filaments. Fructification, pedicellate, moniliform pods, borne on the filaments, and containing, at maturity, a string of elliptical spores, *Duby, Mem. Ceram. p.* 18. (ATLAS, Pl. V. Fig. 20.)
Elaionema villosum, *Berk.* Sporochnus villosus, *Ag.* Conferva villosa, *Huds.*
Hab. On submarine rocks, shells, etc., and on *Zostera*, in four or five fathoms water, rare. Annual. Summer and autumn. Southern coasts of England, not uncommon.

This elegant plant, which was formerly included in the genus *Sporochnus*, has a much closer connection with *Desmarestia*, both in habit and in structure, and it is very probable that the fruit of *Desmarestia* may prove to be

analogous to that of the present genus. At a first glance the difference in the structure of the frond between *Desmarestia* and *Arthrocladia* appears considerable, but a closer examination removes much of the dissimilarity. A jointed tube runs through the centre of both fronds; in the *Desmarestia*, in the form of a slender filament; in the *Arthrocladia* of a wide tube. The confervoid filaments are of the same nature in both genera, and the branching of the fronds identical. The great difference lies in the comparative density of structure.

IX. SPOROCHNUS.

21. **pedunculatus** (*The pedunculated Sporochnus*); stem undivided; branches lateral, long, simple, horizontal; receptacles elliptical, *Ag. Sp. Alg. v.* 1. *p.* 149. (ATLAS, Pl. VI. Fig. 21.)

Gigartina pedunculata, *Lam.* Fucus pedunculatus, *Huds.*

Hab. On submarine rocks, shells, etc., near low-water mark, and at a greater depth; rare. Annual. Summer and autumn.

Sporochnus pedunculatus, though found in several widely separated places on the English and Irish coasts, is nowhere very common, and thus recommends itself by its rarity, as well as its beauty, to the collector. Few objects indeed are more attractive to the eye of a botanist than a fine frond of this species, as it waves its feathery branches in the water; but were the use of the dredge more general with algologists, this, and many other deep-water plants, would probably cease to be regarded as of rare occurrence; and we should be better acquainted with their habits, and the exact localities which they frequent. Most of the specimens now collected, are washed up by the tide, frequently in an imperfect, or decaying condition; or picked out of fishermen's nets, in the meshes of which they get entangled and torn. If raised by the dredge they would not only be found more perfect, but in far greater plenty.

X. CARPOMITRA.

22. **Cabreræ** (*Cabrera's Carpomitra*); frond irregularly dichotomous, linear, narrow, flat, midribbed; branches here and there constricted, *Ktz. Phyc. Gen. p.* 343. (ATLAS, Pl. VI. Fig. 22.)

Sporochnus Cabreræ, *Ag.* Fucus Cabreræ, *Clemente.*

Hab. Cadiz. South of Ireland and in Plymouth Sound. Extremely rare.

This is one of the rarest of the British seaweeds, and interesting from its being one of those species that connect our Flora with that of the Spanish Peninsula. For a long time the only evidence of its occurrence on the British coasts was a solitary specimen picked up on the shore at Youghal by Miss Ball, and by her presented to the Dublin University Museum. From that specimen our figure has been taken. More recently *C. Cabrerœ* was discovered at Plymouth by the Rev. W. S. Hore, by whom, and also by Dr. Cocks and others, it has been repeatedly dredged; and thus the doubts we formerly expressed of its being native to our shores have been satisfactorily removed. It is indeed a widely-distributed plant, recent observations having shown it to be also a native of New Holland, Van Diemen's Land, and Zealand.

Order 3. *LAMINARIACEÆ.*

XI. ALARIA.

23. **esculenta** (*The edible Alaria*); frond elongated, lanceolate, entire; rib narrow, cylindrical; leaflets linear-oblong or cuneate, *Grev. Alg. B. p.* 25. *t.* 4. (Atlas, Pl. VI. Fig. 23.)

Laminaria esculenta, *Lyngb.* Agarum esculentum, *Bory.* Fucus esculentus, *Linn.* F. fimbriatus, *Gm.* F. tetragonus, *Good. and Woodw.* F. teres, *Good. and Woodw.* F. pinnatus, *Fl. Norv.*

Hab. Abundant on the shores of Scotland, and of the north and west of Ireland. Fringing precipitous rocks, at low-water mark. Perennial. Winter and spring.

This beautiful plant, which is scarcely known on the southern coasts of England, abounds on all the Atlantic shores of the British Islands. The roughest water seems to be most favourable to its existence, and I observe that it reaches its greatest size and most luxuriant growth on some of the most exposed parts of our western coasts. Yet the delicate membrane of its leaf is easily torn, and in large specimens is very rarely found free from laceration. It appears to be perennial, the new growth being produced at the base of the leafy frond. The *fructification* commonly to be met with on full-grown specimens, consists of innumerable slender spores, closely packed together, compounded of four sporules. *Alaria esculenta* is eaten in some parts of Scotland and Ireland, as well as in Iceland and the Ferroe Islands. For this purpose the midrib,

stripped of its membrane, only is used. It has a sweetish taste, but is rather insipid.

XII. LAMINARIA.

24. **digitata** (*The fingered Laminaria*); stem long, woody, cylindrical, gradually tapering and somewhat compressed upwards, expanding into a leathery, roundish-oblong frond, deeply cleft into many linear segments, *Lamour. Ess. p.* 22. (ATLAS, Pl. VI. Fig. 24.)

Laminaria stenoloba, *De Lap.* Hafgygia digitata, *Ktz.* Fucus digitatus, *Linn.* F. hyperboreus, *Gunn.*

Hab. On rocks beyond the reach of the tide, extending to the depth of about fifteen fathoms. Perennial. Winter. Abundant.

A well-known plant, the common *Sea-girdles* or *Tangle*, which grows to a large size on all rocky coasts. Our figure may appear a caricature to persons acquainted only with the plant in the state in which it is usually cast ashore, but I have purposely selected a specimen to illustrate its very curious mode of growth. The root and stem are perennial, but the many-cleft leaf is renewed every season and the old one cast off. Our specimen represents the nearly perfectly-formed leaf of the present season, and the base of the leaf of last year adhering to the tips of its segments.

24.* **digitata,** var. **stenophylla** (*narrow-leaved variety*); whole plant dark-brown; stipes slender, flaccid, glossy, becoming compressed or flattened upwards; lamina wedge-shaped and tapering at base, much longer than the stipe, digitate, its segments few, and very narrow. (ATLAS, Pl. VII. Fig. 25.)

Hafgygia digitata, var. stenophylla, *Ktz.* Laminaria conica, *Bory.*

Hab. Common round the shores of the Orkney Islands and the North of Ireland.

A remarkable variety of the preceding species, or entitled to specific distinction. My attention was first drawn to it by my friend the Rev. J. H. Pollexfen, who directed me to some excellent remarks on these *Laminariæ*, furnished by the Rev. C. Clouston, of Orkney, to 'Anderson's Guide to the Highlands and Islands of Scotland.' The differences between these varieties are so marked, that the Orkney kelp-men have assigned peculiar local names to each, calling the ordinary *L. digitata*, "Cuvy," and the form here figured, "Tangle."

25. **bulbosa** (*The bulbous Laminaria*); stem flat, with a waved

margin, once twisted at the base, rising from a roundish, hollow, warted tuber; frond oblong, deeply cleft into many linear segments, *Lam. Ess.* p. 22. (ATLAS, Pl. VII. Fig. 26.)

Laminaria Belvisii, *Ag.* Saccorhiza bulbosa, *De la Pyl.* Haligenia bulbosa, *Dne.* Phycocastanum bulbosum, *Kütz.* Fucus bulbosus, *Huds.* F. polyschides, *Lightf.* F. palmatus, *Gmel.* Ulva bulbosa, *DC.*

Hab. On rocks at low-water mark, and to the depth of 10–15 fathoms. Perennial. Autumn. Abundant.

This is the largest British species of the *Laminarieæ*, its frond in some instances forming, when spread out on the ground, a circle twelve feet in diameter. Its common name is *Furbelows*, and its aspect must be familiar to most visitors of the sea-shore.

26. **longicruris** (*The long-stalked Laminaria*); stipes very long, slender at the base, hollow and inflated in the middle, and gradually tapering to the apex; frond undivided, ovato-lanceolate, membranaceous, obtuse, *De la Pyl. An. Sc. Nat. v. 4. p.* 177. *t.* 9. *f.* A. (ATLAS, Pl. VII. Fig. 27.)

Laminaria ophiura, *Bory.*

Hab. Northern Ocean. Cast ashore.

This is a very distinct and beautiful species, and one of the largest of the genus, the frond being frequently as large as a moderately-sized table-cloth. It abounds along the coast of North America, as far south as Boston Bay, and is of particularly large dimensions, and in great abundance, in the deep harbour of Halifax. It would seem also, from its other recorded habitats, to be generally dispersed through the Arctic Sea. But what are its claims to a place in the British Flora? At present they are extremely doubtful—all the specimens which have been found being merely the stipes, covered with barnacles, and deprived of both root and leaf. The *hollow* stipe, tapering to both ends, is however so remarkable that no mistake can be made in identifying the specimens. In general aspect it resembles *L. saccharina*, but the frond is proportionally broader and more blunt, and of thinner substance; while the very long stem, hollow and somewhat swollen in the middle, will always afford a clear mark of distinction. Our figure is taken from a characteristic specimen collected at Halifax, Nova Scotia.

27. **saccharina** (*The sugared Laminaria*); stem cylindrical, filiform, expanding into a cartilaginous or submembranaceous,

lanceolate, undivided frond, *Lamour. Ess. p.* 22. (ATLAS, Pl. VII. Fig. 28.)

Laminaria latifolia, *Ag.* Fucus saccharinus, *Linn.*

Hab. Northern Ocean, extending round the world, and Atlantic shores of Britain. Attached to rocks and stones near low-water mark, and to the depth to five to ten fathoms. Perennial. Very common.

Every visitant of the sea-shore must be familiar with one form or other of this common plant, which forms a belt, about low-water mark, round all our rocky shores, where its long ribbon-like fronds wave gracefully in the water. It is by no means confined however within these limits, but grows in water from five to ten fathoms deep, attached to shells and stones, when rocks are not to be had. In such situations it often acquires a very large size. The variety called by Agardh *L. latifolia* delights in deep water, especially in sheltered bays and coves protected from the ocean by small islands. In many such places on the west of Ireland and Scotland, where the water is as clear as crystal, the beautiful broad leaves of this variety may be seen growing luxuriantly several fathoms below the boat in which the observer is sailing over them.

28. **Phyllitis** (*The hart's-tongue Laminaria*); stipe short, subcompressed, gradually expanding into a linear-lanceolate, delicately membranaceous, undivided frond, *Lam. Ess. p.* 22. (ATLAS, Pl. VIII. Fig. 29.)

Laminaria saccharina, var., *Grev.* Fucus Phyllitis, *Stack.*

Hab. Atlantic shores of Britain. On rocks and stones, in pools left by the tide; also in four or five fathoms water. Biennial? Summer. Not uncommon.

This plant has been observed by botanists from a very early period, and almost invariably kept distinct from *L. saccharina*, its nearest ally, by every author who has written on the subject. Though there is a close resemblance, there is a clear distinction at all ages between living plants: *L. saccharina* being thicker, of darker colour, and with a more abrupt base than *L. Phyllitis*, whose delicately membranous nature, and strictly lanceolate form, are preserved to a very large size. The latter also very rapidly changes colour in fresh water, while the former may be preserved for some hours in that medium.

29. **Fascia** (*The band Laminaria*); stem very short, setaceous, gradually expanding into a membranaceous, broadly-oblong,

wedge-shaped, lanceolate, or linear frond, *Ag. Syn. p.* xix. (Atlas, Pl. VIII. Fig. 30.)

Laminaria debilis, *Ag.* L. cuneata, *Suhr.* L. papyrina, *Bory.* Fucus fascia, *Fl. Dan.*

Hab. Atlantic shores of Britain. On sand-covered submarine rocks and stones in the sea, near low-water mark. Annual. Summer.

At first sight the forms of *Laminaria fascia* figured for this species appear to be distinct, the long strap-shape of one contrasting with the broadly ovate form of the other. But the slight importance to be attached to such variations becomes at once evident to any observer who collects the plant in any quantity, on its native rock, and to whom specimens ranging from the broadest to the narrowest, occur in the same locality. From a very extensive suite of specimens from several parts of the coast, and of all shapes and sizes, I have selected a few for illustration, in which a gradation of form is well shown from the broad, abruptly stipitate *L. debilis* to the ribbon-like *L. fascia*. In uniting these under one specific head, I of course preserve the trivial name which was first proposed.

XIII. CHORDA.

30. **filum** (*The thread Chorda*); frond cartilaginous, lubricous, clothed with pellucid hairs, filiform, very long, tapering to each extremity, not constricted at the dissepiments, *Lamour. Ess. p.* 26. (Atlas, Pl. VIII. Fig. 31.)

Chordaria filum, *Ag.* Scytosiphon filum, *Ag.* Fucus filum, *Linn.* F. tendo, *Esper.* Ceramium filum, *Roth.* Chorda tomentosa, *Lyngb.*

Hab. North Atlantic. On rocks and stones in the sea, commencing within tide-marks, and extending in still water to the depth of ten or fifteen fathoms. Annual. Summer and autumn. Very abundant.

Few persons can visit the coast without becoming familiar with this common plant, which is to be found in greater or less perfection on all our shores. But it is in quiet land-locked bays, with a sandy or somewhat muddy bottom, and in from three to six fathoms water, that it reaches its greatest size. In such places it frequently forms extensive submarine meadows, so dense as seriously to affect the passage of boats, and to endanger the life of the unfortunate swimmer who may chance to become entangled in its slimy cords, which when growing have considerable tenacity.

31. **lomentaria** (*The jointed Chorda*); frond membranaceous, constricted at distant intervals, the interstices inflated, *Lyngb. Hyd. Dan. p.* 74. *t.* 18. (Atlas, Pl. VIII. Fig. 32.)

Chorda fistulosa, *Zanard.* Scytosiphon lomentaria, *Endl.* S. filum, var., *Ag.* Solenia fuscata, *Bory.* Asperococcus castaneus, *Carm.* Chlorosiphon Shuttleworthianus, *Kütz.*

Hab. Atlantic shores of Britain. On rocks, stones, and the smaller Algæ, in tide-pools. Annual. Summer and autumn. Abundant.

A common plant, of little beauty, widely dispersed through the temperate oceans of both hemispheres. In a young state no septa are visible externally, the frond being filiform. In this condition it is sometimes a little difficult to distinguish specimens of *Chorda lomentaria*, from narrow ones of *Asperococcus echinatus*, except by their more chestnut colour and more polished surface, and Captain Carmichael has described such individuals under the name of *A. castaneus*.

Order 4. *DICTYOTACEÆ.*

XIV. CUTLERIA.

32. **multifida** (*The many-slit Cutleria*); frond thickish, polymorphous, flabelliform, irregularly cleft into numerous narrow laciniæ; axils very acute; apices attenuated, pencilled, *Grev. Alg. Brit. p.* 60. *t.* 10. (Atlas, Pl. IX. Fig. 33.)

Zonaria multifida, *Ag.* Dictyota penicillata, *Lamour.* D. multifida, *Bory.* Sporochnus multifidus, *Spreng.* Ulva multifida, *Smith.*

Hab. Coasts of England and Ireland. On rocks and shells in the sea, in 4–15 fathoms water. Annual. Summer and autumn. Rare.

Although found on many parts of our coasts, *Cutleria multifida* is still considered a rare species, partly perhaps from its place of growth being beyond the limit of ordinary tides. Occasionally, after stormy weather, it is washed up in some plenty. No genus can be more distinct, and few, among the *Dictyoteæ*, have a more delicate or curious structure. The fruit is very remarkable.

XV. HALISERIS.

33. **polypodioides** (*The Polypody-like Haliseris*); frond dichotomous, entire at the margin, plane; spots of fructification linear, disposed along the midrib, *Ag. Sp. Alg. v.* 1. *p.* 142. (Atlas, Pl. IX. Fig. 34.)

Dictyopteris polypodioides, *Lamx.* D. elongata, *Lamx.* Fucus polypodioides, *Desf.* F. membranaceus, *Stack.* F. ambiguus, *Clem.* Ulva polypodioides, *Dec.*

Hab. Atlantic shores of Britain. On rocks and stones in the sea, from two to five fathoms. Perennial. Summer and autumn. Rare.

The appellation of this species is in allusion to the resemblance which its fructification bears to that of a *Polypodium*. In the British Islands it is decidedly rare, and chiefly found on the southern and western shores. It does not appear to be found in Scotland. In the south of Europe it is common, especially in the Mediterranean, and has been brought from the tropics of either hemisphere. Several other species of *Haliseris* are now known, all natives of warm latitudes, and all with much the same habit. It is abundant in the Tropical Ocean, and reaches its northern limit on the southern shores of England.

XVI. PADINA.

34. **pavonia** (*The peacock's-tail Padina*); frond between membranaceous and coriaceous, broadly fan-shaped, entire or deeply cleft, powdery on its outer surface; concentric lines numerous, *Lamour. Dict. Clas. d'Hist. Nat. v.* 12. *p.* 589. (Atlas, Pl. IX. Fig. 35.)

Padina Mediterranea, *Bory.* Dictyota pavonia, *Lamour.* Zonaria pavonia, *Ag.* Ulva pavonia, *Linn.* U. cucullata, *Cav.* Fucus pavonius, *Linn.*

Hab. Southern coasts of England. On rocks in shallow pools, at half-tide level. Annual. Summer and autumn.

So singular a species as this is could not fail to be observed at an early period, and notices of it occur in Bauhin and other early writers. An excellent account is given by Ellis, accompanied by a figure with very correct dissections, in his celebrated work on Corallines, into which he has introduced it, not on the supposition of its animal nature, but from the elegance of its form, and singularity. Its general resemblance to the expanded tail of the peacock has been noticed by all authors. When viewed growing under water, this resemblance is peculiarly striking, the fringes of capillary fibres which adorn it, decomposing the rays of light, and giving rainbow colours to the surface. It is abundant in the Tropical Ocean, and reaches its northern limit on the southern shores of England.

XVII. ZONARIA.

35. **collaris** (*The collar Zonaria*); frond procumbent, coriaceous, orbicular, or cuneate and variously lobed, from its upper surface emitting cup-shaped, membranaceous fronds; the under surface rooting, densely stupose, *Ag. Sp. Alg. v.* 1. *p.* 127. (Atlas, Pl. XIII. Fig. 49.)

Padina collaris, *Grev.* P. omphalodes, *Mont.* Zanardinia prototypus, *Nardo.*

Hab. Jersey. (Washed ashore.)

This most interesting addition to the Channel *Nereis*, was recently found on the shores of Jersey, by Miss Turner, to whom I am indebted for the specimens here figured, and which I rejoice to be able to include in the present work. They were "quite fresh," Miss Turner informs me, "when picked up; lying among other Algæ on the sand in Granville Bay; they had a saucer-like shape, which they have lost in pressing." They consist merely of the secondary fronds, accidentally torn from the firmly-attached primaries, which may possibly be reached by dredging on the coast. Never having seen the primary frond, I give the specific character and description nearly in the words of Agardh.

36. **parvula** (*The small Zonaria*); frond procumbent, attached by fibres issuing from its lower surface, membranaceous, suborbicular, variously lobed; lobes free, rounded, scarcely marked with concentric lines, *Grev. Crypt. Fl. t.* 360. (Atlas, Pl. XIII. Fig. 50.)

Padina parvula, *Grev.* P. reptans, *Crouan.* Padinella parvula, *Aresch.* Aglaiozonia parvula. *Zanard.* A. reptans, *Kütz.*

Hab. Atlantic coasts. On stones and nullipores near low-water mark, and especially on nullipore banks in 4–15 fathoms water. Perennial? Summer.

This is not an uncommon plant on various parts of our coast, though frequently overlooked, owing to its hiding in crevices, or creeping through the much-branched stony nullipores. When occurring on rocks near low-water mark, it is broader, less branched, and of paler colour than when dredged from deeper water. No one in this country has met with fructification.

XVIII. TAONIA.

37. **atomaria** (*The banded Taonia*); frond broadly wedge-shaped or somewhat fan-shaped, deeply and irregularly cleft longitudinally; seeds forming waved transverse lines, with

intermediate broken ones, *Grev. Alg. Brit. p.* 58. (ATLAS, Pl. IX. Fig. 36.)

Dictyota zonata, *Lamour.* D. ciliata, *Lamour.* Zonaria atomaria, *Ag.* Padina atomaria, *Montag.* P. phasiana, *Bory.* Stypopodium atomarium, *Ktz.* Ulva atomaria, *Woodw.* U. serrata, *De Cand.*

Hab. On marine rocks, rare. Annual. Summer.

In England this species is completely a summer plant, reaching its perfection in July, and decaying before the end of September, at which season it has lost its glossy surface, rich colours, and much of its delicacy; it is then coarse, almost coriaceous, dirty-brown and ragged.

XIX. DICTYOTA.

38. **dichotoma** (*The forked Dictyota*); frond regularly dichotomous, linear; segments cuneate at the base, erect or erecto-patent, gradually narrower towards the apices, axils rounded, *Lamour, Ess. p.* 58. (ATLAS, Pl. X. Fig. 37.)

Zonaria dichotoma, *Ag.* Dichophyllium vulgare, *Ktz.* D. dichotomum, *Ktz.* D. implexum, *Ktz.* Haliseris dichotoma, *Spreng.* Ulva dichotoma, *Huds.* Dictyota implexa, *Lamx.*

Hab. Parasitical on various Algæ; also growing on rocks and stones in tide-pools near low-water mark, and at a greater depth. Annual. Summer. Abundant.

A very common plant, the most widely dispersed of the genus to which it belongs, being found along the shores of the greater part of the temperate ocean, and also in many intertropical localities. As might be expected, it varies considerably according to the circumstances under which it grows, though without any respect to *climate*, the most opposite varieties being frequently found on the same shore. The variations appear to result merely from the depth of water at which the plant grows, and the degree of exposure to waves and currents to which it is subjected. In rock-pools near high-water mark and to half-tide level the narrow variety, which sometimes is much narrower and greatly more intricate than our figure represents, is the commoner. Near low-water mark in rock-pools, and among the *Laminariæ* in sheltered bays, the broad variety occurs, of which the average size is represented in the figure.

XX. STILOPHORA.

39. **rhizodes** (*The root-like Stilophora*); frond subsolid, much

and irregularly branched, the branches subdichotomous, attenuated; ramuli scattered, forked; fructification densely covering the whole plant, *J. Ag. Linn. v.* 15. *p.* 6. (ATLAS, Pl. X. Fig. 38.)

Spermatochnus rhizodes, *Ktz.* Sporochnus rhizodes, *Ag.* Chordaria rhizodes, *Ag.* Fucus rhizodes, *Turn.* Conferva rhizodes, *Ehr.* C. gracilis, *Wulf.* C. verrucosa, *E. Bot.* Ceramium tuberculosum, *Roth.*

Hab. Southern shores of England, frequent. Common on the eastern, southern, and western shores of Ireland. Near low-water mark, growing either on rocks, or parasitically on other Algæ. Annual. Summer.

Hitherto, in British works, the plant here figured has been regarded as a species of *Sporochnus*. It is now removed, according to the views of all recent continental authorities, to the *Dictyoteæ*, in which family it constitutes the type of a new genus. If we compare its fructification with that of *Asperococcus*, or of *Punctaria*, we shall be satisfied that its true place in the system cannot be very far apart from these genera. From the true *Sporochni* the fructification of the present plant essentially differs, the position of the spores, their form, and the nature of the filaments that accompany them, being quite dissimilar.

40. **Lyngbyæi** (*Lyngbye's Stilophora*); frond tubular, at length distended, much branched, the branches dichotomous, spreading, with wide, rounded axils, much attenuated toward the apices; ramuli scattered, forked, capillary; sori subdistant, disposed in transverse lines, *J. Ag. Symb. v.* 1. *p.* 6. (ATLAS, Pl. X. Fig. 39.)

Scytosiphon paradoxus, *Fl. Dan.* Spermatochnus paradoxus, *Ktz.* Chordaria paradoxa, *Lyngb.* Striaria Grevilleana, *Pollexf.* Sporochnus rhizodes, β paradoxa, *Ag.*

Hab. Atlantic coasts of Britain. In land-locked bays, and estuaries, on a muddy and sandy bottom, in 4-10 fathoms water. Annual. Summer.

Hitherto this plant has appeared in British works as a variety of the preceding species, and notwithstanding its different appearance, when *typical* specimens of each are under examination, it is not without hesitation that I admit the present to be specifically distinct. Those who are acquainted with the difference in aspect assumed by marine plants, according to the depth of water at which they grow, will best understand my doubts; remembering that the typical *S. rhizodes* grows within tide-marks, and *S.*

Lyngbyæi at a considerable depth, beyond the reach of the tide. And the differences between the two are precisely of the nature of those caused by deep water. For this reason I am inclined to question its right to be considered a species distinct from *S. rhizodes*.

XXI. DICTYOSIPHON.

41. **fœniculaceus** (*The fennel Dictyosiphon*); frond setaceous, very much branched; branches capillary, decompound; ramuli subulate, alternate or scattered, rarely opposite, *Grev. Alg. Brit. p.* 56. *t.* 8. (Atlas, Pl. X. Fig. 40.)

Scytosiphon fœniculaceus, *Ag.* Fucus subtilis, *Turn.* Conferva fœniculacea, *Huds.*

Hab. In rock-pools, between tide-marks, on stones, or growing parasitically on other Algæ. Annual. Spring and summer. Common.

A common inhabitant of tide-pools, and not inelegant, especially when clothed with the fine soft hairs which cover its surface closely, when in a young and vigorous state, before it has suffered from the wear and tear of its short existence. A distinguished Swede, Areschoug, regards this plant as an abnormal state of *Chordaria flagelliformis*, in which the horizontal filaments of the periphery have not been developed.

XXII. STRIARIA.

42. **attenuata** (*The tapering Striaria*); branches and ramuli mostly opposite, tapering to each extremity, *Grev. Crypt. Fl.* (*Syn.*) *p.* 44. (Atlas, Pl. XI. Fig. 41.)

Scytosiphon olivascens, *Carm.* Carmichaelia attenuata, *Grev.* Zonaria Naccariana, *Ag.* Z. lineolata, *Ag.* Stilophora crinita, *Ag.* Solenia crinita, *Ag.* S. attenuata, *Ag.* Ulva attenuata, *Nac.* Dictyota lineolata, *Grev.* Conferva crinita, *Ruch.*

Hab. Parasitical on the smaller Algæ, generally growing beyond the tide range. Annual. Summer.

As far as the British Flora is concerned, the merit of having discovered this plant belongs to the late talented and indefatigable Captain Carmichael, of Appin, who detected it upon the west coast of Scotland, in the year 1825 or 1826. In 1827 a figure of it appeared in Dr. Greville's 'Cryptogamic Flora;' in 1831 it was discovered in Ireland, and in 1833 added to the Flora of Devonshire. But if the very numerous synonyms detailed above, and many

of which I have transferred from the excellent work of Meneghini, all belong, as there is little doubt, to our plant, it was first observed in the Mediterranean Sea, where it appears to be not very uncommon, in several places.

XXIII. PUNCTARIA.

43. latifolia (*The broad-leaf Punctaria*); frond oblong or obovate, suddenly tapering at the base, pale olive-green, thickish, gelatinous and tender, *Grev. Alg. Br. p.* 52. (Atlas, Pl. XI. Fig. 42.)

Phycolapathum debile, *Ktz.*

Hab. Rocks and stones in the sea. Annual. Summer.

The genus *Punctaria* is exactly analogous among *Dictyoteæ* to *Ulva* in *Ulvaceæ*, and so closely do its species resemble the *Ulvæ* in form and substance, that without reference to fructification, or without a close examination of the structure of the frond, a young botanist might sometimes confound the species of one genus with those of the other. It requires also a careful examination to distinguish at all times between *Laminaria debilis* and *Punctaria latifolia*, the form and colour of both being nearly identical. The *Laminaria* is however, to the naked eye, more glossy, and adheres much less firmly to paper; and its structure, instead of being reticulated, is closely cellular. This species was founded in 1839 by Dr. Greville, and has since been detected in tolerable plenty on several of our coasts.

44. plantaginea (*The Plantain Punctaria*); frond lanceolate or obovato-lanceolate, cuneate and gradually attenuated at base, brownish-olive, coriaceo-membranaceous, *Grev. Alg. Brit. p.* 53. *t.* 9. (Atlas, Pl. XI. Fig. 43.)

Diplostromium plantagineum, *Ktz.* Zonaria plantaginea, *Ag.* Ulva plantaginea, *Roth.* U. plantaginifolia, *Wulf.* Laminaria plantaginea, *Ag.*

Hab. Not uncommon on the English and Irish coasts. On rocks and stones, between tide-marks, and in rocky tide-pools; occasionally on Algæ. Annual. Spring and summer.

By contrasting the figure of this with the preceding species, the difference between typical forms of these plants will be readily seen, the present being characterized by its dark colour, cuneate base, and more lanceolate general outline. I wish it could be said that such characters admitted of no approximation to their opposites. But though specimens may be collected in plenty in which these pecu-

liarities can clearly be seen, yet it must be admitted that other individuals are frequently found which show them in a more or less weakened state, and approach in a greater or less degree to some of the forms of *P. latifolia*, so that, on the whole, I am disposed to consider these species as not permanently distinguishable from each other.

45. **tenuissima** (*The very thin Punctaria*); frond sublinear, very thin, transparent, *Grev. Alg. Brit. p.* 54. (ATLAS, Pl. XIII. Fig. 51.)

Punctaria undulata, *J. Ag.* Ulva plantaginifolia, *Lyngb.* Diplostromium plantagineum, *Ktz.*

Hab. Parasitical on *Zostera marina*, *Chorda filum*, etc., near low-water mark. Annual. Summer.

This species has never been found in a state of fruit, and hence some botanists (among others my valued friend Mrs. Griffiths) regard it as the young of some other species, perhaps of *P. latifolia*, with which its substance more nearly agrees than with that of *P. plantaginea*. But its great difference in form seems to forbid such an opinion being hastily adopted, particularly as young *P. latifolia* may be found of much smaller size, and with a broader and more ovate frond. The plant does not seem to be found all round our coast.

XXIV. ASPEROCOCCUS.

46. **compressus** (*The compressed Asperococcus*); frond compressed, flat, linear-lanceolate, obtuse; dots of fructification oblong, *Griff. MS. Hook. B. F. v.* 2. *p.* 278. (ATLAS, Pl. XI. Fig. 44.)

Haloglossum Griffithsianum, *Ktz.*

Hab. Southern shores of England. Parasitical on Algæ, beyond low-water mark; usually cast on shore. Annual. Summer.

An interesting plant, curiously connecting the genus *Asperococcus* and *Punctaria*, having a frond nearly intermediate in character between that of these genera, but possessing rather more of the structure of the former. It appears to be of not unfrequent occurrence in the Mediterranean, several stations being recorded; and I have gathered very large specimens at the Cape of Good Hope, much larger than any others that I have seen. In the British seas it has as yet only been found along the southern shores of England and in the Channel Islands.

47. **Turneri** (*Turner's Asperococcus*); frond inflated, cylindri-

cal, obtuse, oblong or club-shaped, suddenly contracted at the base into a short stem, thin and membranaceous; dots of fructification minute, roundish, *Hook. Br. Fl. v.* 2. *p.* 277. (Atlas, Pl. XII. Fig. 45.)

Asperococcus bullosus, *Lamour.* A. rugosus, *Dub.* Encœlium bullosum, *Ag.* Gastridium Opuntia, *Lyngb.* Ulva Turneri, *Dillw.*

Hab. In the sea, on stones and the larger Algæ, on *Zostera*, etc., often growing in 4–5 fathoms. Annual. Summer and autumn.

Asperococcus Turneri appears to delight in land-locked muddy bays, where it grows to a gigantic size. Specimens upwards of three feet in length have been dredged by Mr. Thompson in Strangford Lough. I have seen individuals not much inferior in the little harbour of Dingle, and in the long deep channel which separates Valentia from the mainland. When growing in deep water, its favourite habitat is on the stems and leaves of *Zostera*. Specimens gathered within the tide-range are of much smaller size, not more than a few inches in length. Except in size it is subject to little variation. It may always be known from *A. echinatus* by its greater delicacy of texture, more evident reticulations, paler colour, and more obtuse and inflated frond. Named by Dillwyn after Mr. Dawson Turner, the father of modern Phycology.

48. **echinatus** (*The prickly Asperococcus*); frond cylindrical, obtuse or acute, much and gradually attenuated to the base, *Grev. Alg. Brit. p.* 50. *t.* 9. (Atlas, Pl. XII. Fig. 46.)

Asperococcus fistulosus, *Hook.* A. vermicularis, *Moore.* A. rugosus, *Lamour.* Encœlium echinatum, *Ag.* E. Lyngbyanum, *Grev.* Scytosiphon fistulosus, *Lyngb.* S. filum, var. fistulosum, *Ag.* Ulva fistulosa, *Huds.* Conferva fistula, *Roth.*

Hab. On stones, etc., between tide-marks. Annual. Summer and autumn.

A very common, but we cannot say a very beautiful plant; one of the least highly organized of the family to which it belongs, and the coarsest in its mode of growth. The only variation to which it is subject is the size, and the more or less tapering extremities. The size varies so greatly that very good observers have contended for two species.

XXV. LITOSIPHON.

49. **pusillus** (*The small Litosiphon*); fronds tufted, thread-

shaped, very long, equal in diameter throughout, reticulated, clothed with pellucid hairs; spores scattered, *Harv. Man. ed.* 2. *p.* 43. (Atlas, Pl. XIII. Fig. 52.)

Asperococcus pusillus, *Carm.*

Hab. Parasitical on *Chorda filum.* Annual. Summer. Common all round the coast.

The old fronds of *Chorda filum* are frequently infested, towards the close of summer, with the parasite here figured, which changes them into shaggy ropes, soft and slippery to the touch. When placed in water the innumerable thread-like fronds of the *Litosiphon* stand out from the *Chorda*, and spread in all directions round it, like the hairs of a bottle-brush. As a genus it seems to come nearest to *Dictyosiphon*, from which it obviously differs in having an unbranched frond.

50. **Laminariæ** (*The Laminaria Litosiphon*); fronds stellately tufted, short, cylindrical, blunt, slightly tapering at the base, smooth (or hairy toward the apex), transversely banded, the bands close together; spores scattered, or several in each transverse band, *Harv. Man. ed.* 2. *p.* 43. (Atlas, Pl. XIII. Fig. 53.)

Desmotrichum Laminariæ, *Ktz.* Bangia Laminariæ, *Lyngb.* Asperococcus? Laminariæ, *J. Ag.*

Hab. Atlantic shores of Britain. Parasitical on the fronds of *Alaria esculenta*, common on that plant in the summer and autumn. Annual.

This poor little plant has been sadly tossed about among botanists from one part of the system to the other, nor is it yet very certain whether it will be allowed to bear the name under which it is now described, or whether that must be changed into *Desmotrichum.* Should it be found, on comparison, to agree in structure with the other species so named, our genus *Litosiphon*, which has been formed to include the present plant and the *Asperococcus pusillus*, Carm., must probably be given up.

Order 5. *CHORDARIACEÆ.*

XXVI. CHORDARIA.

51. **flagelliformis** (*The whip Chordaria*); frond subsimple, furnished with closely-set, long, simple, filiform branches; ramuli very few or none; filaments of the periphery club-shaped, the terminal cellule large or small, *Ag. Syn. p.* 12. (Atlas, Pl. XII. Fig. 47.)

Gigartina flagelliformis, *Lamour.* Fucus flagelliformis, *Fl. Dan.*
Hab. Atlantic shores of Britain. On rocks and stones in the sea, between tide-marks. Annual. Summer. Common on the shores of the British Islands.

A very common plant in the North Atlantic, but strangely misunderstood by early writers, who confounded it with *Gracilaria confervoides*, a mistake which, with modern microscopes, it would be impossible to fall into. The fructification, which was first described by Turner, has been overlooked by many authors, and yet it is not unfrequently produced. I have generally found an abundance of spores in full-grown plants gathered in the months of July and August. They may most easily be elicited by compressing a small part of a branch between two pieces of glass, and appear to exist in equal numbers in all parts of the plant.

52. **divaricata** (*The divaricate Chordaria*); frond irregularly divided; branches divaricate, subdichotomous, flexuous, furnished towards the apices with short, very patent, mostly forked ramuli; filaments of the periphery capitate, *Ag. Syn. p.* 12. (Atlas, Pl. XII. Fig. 48.)

Mesogloia divaricata, *Ktz.*

Hab. Belfast Lough. Annual. Autumn. Thrown up from deep water, at Carrickfergus.

The *branching* of this species is sufficiently unlike that of *Chordaria flagelliformis*, resembling much more closely that of *Stilophora rhizodes*, to which outwardly our plant bears a very great resemblance. But besides a difference in habit, it is well distinguished from *C. flagelliformis* by the shape of the filaments of the periphery, which in that species are club-shaped, while in this they are slender, but terminated by a large globular cellule. In this respect there is a resemblance to a *Mesogloia*, but the structure of the axis is exactly that of *Chordaria*.

XXVII. MESOGLOIA.

53. **vermicularis** (*The worm-like Mesogloia*); frond unequally distended, clumsy; branches irregularly pinnate, thick, worm-like, lineari-fusiform; ramuli copious, long, flexuous, resembling the main branches, *Ag. Syn. p.* 126. (Atlas, Pl. XIV. Fig. 55.)

Trichocladia vermicularis, *Harv.* Helminthocladia vermicularis, *Harv.* Rivularia vermiculata, *E. Bot.* Chætophora vermiculata, *Hook.*

Hab. Atlantic shores of Britain. On rocks and stones in the sea, about half-tide level. Annual. Summer. Common.

This species, the best known and earliest described of the genus, as now restricted, appears to have been first noticed by Dr. Drummond, who discovered it cast on shore at Larne, in August 1806. It is common on many parts of the coasts of England, Scotland, and Ireland, and is found in the island of Jersey. In the north-east of Ireland, where it was first noticed, Mr. Thompson finds it in profusion, and has observed, among heaps of seaweed cast on shore, "the partiality of the *Idotea æstrum*, Leach, for the gelatinous *Mesogloia vermicularis*, plants of which it had very much eaten, leaving the other Algæ, of which there were many species in the heap, quite untouched."

54. **Griffithsiana** (*Mrs. Griffiths's Mesogloia*); frond slender, equal throughout; branches alternate or irregular, filiform, long, simple, nearly bare of ramuli, *Grev. MS.; Hook. Br. Fl. v. 2. p.* 387. (Atlas, Pl. XIV. Fig. 56.)

Hab. Atlantic shores of Britain. In rock-pools between tide-marks, rare. Annual. Summer.

This species bears a striking resemblance in its ramification to *Chordaria flagelliformis*, but is always of a much paler colour, and the microscopic structure very different; the axis being much less dense, and the substance more gelatinous and tender. Still there is a considerable similarity in structure, and evidently an affinity, through this species, between the two genera.

55. **virescens** (*The pale-green Mesogloia*); frond filiform, gelatinous; branches long, slender, villous; ramuli numerous, patent, short, linear, obtuse, *Carm., Hook. Br. Fl. v. 2. p.* 387. (Atlas, Pl. XIV. Fig. 57.)

Mesogloia affinis, *Berk.* M. Hornemanni, *Suhr.*? Tricholadia virescens, *Harv.* Helminthocladia virescens, *Harv.* Mesogloia gracilis, *Carm.* M. Zosteræ, *Aresch.* Rivularia Zosteræ, *Mohr.*

Hab. Northern shores of Britain. On rocks, stones, and Algæ, at half-tide level. Annual. Spring and summer. Common.

An abundant species on all our coasts, from the north of Scotland to Cornwall, and subject to little variation except in the amount of its ramification. Sometimes the branches are even more densely set than our figure represents; often they are more distant, and occasionally the frond is very much less divided. The appearance of a branch of this species under the microscope is very beau-

tiful, owing to the great length and full greenish-olive hue of the filaments composing the periphery, which are set in a looser gelatine than in any other of our British kinds, and give the frond a singularly villous appearance to the naked eye. In this respect it differs from *M. Griffithsiana*, which is of a much firmer and more compact substance.

XXVIII. LEATHESIA.

56. **tuberiformis** (*The tuber-shaped Leathesia*); fronds olivaceous, tuberous, when young stuffed with cottony fibres, at length hollow, *S. F. Gray, Nat. Ar. Br. Pl. v.* 1. *p.* 301. (Atlas, Pl. XIII. Fig. 54.)

Leathesia marina, *Endl.* L. difformis, *Aresch.* Corynephora marina, *Ag.* Chætophora marina, *Lyngb.* Nostoc marinum, *Ag.* Tremella difformis, *Linn.* Rivularia tuberiformis, *E. Bot.*

Hab. Atlantic shores of Britain. Between tide-marks, on rocks, corallines, and the smaller Algæ; very common. Annual. Summer and autumn.

Common on all our rocky shores, first appearing about April or May in the form of little pea-like buttons, attached to small Algæ, or grouped in clusters on the surface of rocks and corallines, and, as the season advances, gradually acquiring size; the fronds becoming hollow and cohering in masses. I adopt the name selected by the founder of the genus, and which dates from 1809, because it well expresses the aspect of the plant,—"like a cluster of small potatoes."

57. **Berkeleyi** (*Berkeley's Leathesia*); fronds dark brown, depressed, fleshy, solid; filaments densely packed. (Atlas, Pl. XV. Fig. 59.)

Chætophora Berkeleyi, *Grev.*

Hab. South of England and west of Ireland. On submarine rocks, between tide-marks; exposed at low water. Annual. Summer.

A small plant, more curious than beautiful, first noticed by the Rev. M. J. Berkeley on rocks at Torquay. On the west coast of Ireland it is plentiful in several places, and probably is pretty generally distributed along our shores, being overlooked on account of its being often nearly of the colour of the rock on which it grows, and resembling, in its fleshy appearance and feel, the collapsed body of the

common *Actinia*. From the preceding species, *L. Berkeleyi* differs in being at all times of a dense and solid substance (not, as *L. tuberiformis*, at first flocculent within, and then hollow), in its different colour, and more depressed form.

XXIX. RALFSIA.

58. **verrucosa** (*The warty Ralfsia*) ; frond coriaceo-crustaceous, fixed by its inferior surface, orbicular, concentrically zoned; composed of densely packed, vertical, simple filaments; fructification, depressed warts, scattered over the upper surface, containing obovate spores fixed to the bases of vertical filaments, *Aresch.* (Atlas, Pl. XV. Fig. 60.)

Hab. Common on the rocky shores of the British Islands, between high-water mark and half-tide level. Perennial. Winter.

This singular production more nearly resembles, to the naked eye, a crustaceous Lichen than an Alga, but its structure and fructification prove it to be widely different from any Lichen. There is a curiously close resemblance, both in the habit, the structure of the frond, and the outward character of its fruit, between *Ralfsia* and *Peyssonelia;* yet, according to the received notions of arrangement, these plants must be referred to opposite parts of the system. They are, however, closely analogical forms in the families to which they respectively belong. Except for the colour and the different formation of the spores, there would be little to distinguish them.

XXX. ELACHISTA.

59. **fucicola** (*The Fucus-inhabiting Elachista*) ; tufts pencilled; filaments elongate, flaccid, membranaceous, attenuated upwards; articulations once or twice as long as broad; tubercular mass spherical, *Fries, Fl. Scan. p.* 317. (Atlas, Pl. XV. Fig. 61.)

Myrionema fucicolum, *Endl.* Phycophila fucorum *and* Ph. Agardhii, *Ktz.* Conferva fucicola, *Velley.* C. ferruginea, *Ag.*

Hab. Atlantic shores of North Britain. Parasitical on *Fucus serratus* and *F. vesiculosus*. Annual. Summer and autumn. Common.

This the largest species, the longest known, and the commonest of the genus *Elachista*. It infests *Fucus vesiculosus* and *F. serratus* almost wherever these plants grow, and may be found nearly at every season. At its first appearance it forms a minute pencil of greenish filaments

rising from a scarcely perceptible tubercle. As it grows larger, the colour changes to brown, and the tubercle increases much in size, and at length becomes a button, attached by a central point. It then falls away and the plant perishes. The growth of other *Elachistæ* is very similar. By J. Agardh this genus is placed with the *Ectocarpeæ*, but in my opinion incorrectly.

60. **flaccida** (*The flaccid Elachista*); tufts pencilled: filaments elongate, flaccid, membranaceous, much attenuated to the base; the lower articulations half as long as broad, the upper of equal length and breadth; tubercle hemispherical, *Aresch.* (Atlas, Pl. XV. Fig. 62.)

Elachista breviarticulata, *Aresch.* Phycophila flaccida, *Ktz.* Myrionema breviarticulatum, *Endl.* Conferva flaccida, *Dillw.* C. obtusa, *Ag.* C. breviarticulata, *Suhr.*

Hab. Atlantic coasts of England. Parasitical on *Cystoseira fibrosa*, common. Annual. Summer and autumn.

A very common parasite on *Cystoseira fibrosa*, whose branches are rarely found free from the olive-coloured soft pencils of this little plant. In size and appearance to the naked eye there is much resemblance to preceding species, except that the colour is generally greener, and the length of the tufts rather less; but under the microscope these species are very readily known from one another. *E. flaccida* is remarkable for the shortness of its articulations, in proportion to their breadth throughout the lower and middle portions of the filaments, and for the gradually increasing length of the cells towards the apices. The filaments, also, taper exceedingly at the base; and the tubercle from which they originate is of very much smaller size than in *E. fucicola*.

61. **curta** (*The short Elachista*); filaments very short, tapering to the base, obtuse, pencilled, rather rigid, rising from a tubercle; articulations about as long as broad; spores pyriform, on long pedicels; paranemata linear-clavate, *Aresch. in Linn. v.* 16. *p.* 234? (Atlas, Pl. XV. Fig. 63.)

Conferva curta, *Dillw.*

Hab. Swansea. On *Fuci*, between tide-marks. Annual. Summer.

This species has long been in doubt, and notwithstanding the figure and description now given, my doubts are not fully removed. By Dillwyn, who first described *E. curta*, it is said to be common in the neighbourhood of Swansea, and probably not rare elsewhere; yet no one

has met with it of late years. I have repeatedly brought home the battered stumps of *E. fucicola* in the belief, always dissipated by the microscope, that I had met with *E. curta;* and my only acquaintance with the latter is from an examination of a poor specimen preserved in Sir W. J. Hooker's Herbarium, from which my figure has been prepared.

62. **stellulata** (*The starred Elachista*) ; tufts very minute, stellate ; tubercle composed of large cells ; filaments short, tapering to the base, linear, club-shaped, obtuse ; articulations about twice as long as broad, uniform ; paranemata with short articulations, *Griff. MSS. Aresch. Pug. in Linn. v.* 17. *p.* 261. (Atlas, Pl. XV. Fig. 64.)

Myrionema stellulatum, *J. Ag. et Gen.* Conferva stellulata, *Harv.*

Hab. Torquay. Parasitical on *Dictyota dichotoma.* Annual. Summer.

This minute and microscopically beautiful little plant was discovered some years ago by Mrs. Griffiths on the old fronds of *Dictyota dichotoma*, and first described in the first edition of the 'Manual of British Algæ.' I have not seen any other specimens than those originally collected by Mrs. Griffiths, who met with the parasite infesting several specimens of the *Dictyota ;* nor am I aware that any other observer has noticed it in Britain, or that it has been detected elsewhere. The Alga on which it grows is so very widely scattered that our *Elachista* ought, probably, to have a place in many distant Floras, but its minute size has hitherto been its protection. It looks so much like the fructification of the *Dictyota*, when carelessly examined with the naked eye, or with a lens of small power, that it may often be passed over as such ; and I was once disposed to think that it might be merely a diseased proliferous state of that fructification. This opinion I have long abandoned, and recognized this production as a true parasite.

63. **scutulata** (*The little shield Elachista*) ; filaments short, rising from an oblong, convex, shield-like tubercle, composed of densely packed, branching fibres ; articulations twice or thrice as long as broad ; spores oblong, *Duby, Bot. Gall. v.* 2. *p.* 972. (Atlas, Pl. XVI. Fig. 65.)

Conferva scutulata, *Eng. Bot.*

Hab. Parasitical on the thongs of *Himanthalia lorea.* Annual. Summer and autumn. Very common.

This curious parasite, quite an interesting object under the microscope, is found wherever *Himanthalia lorea* (*Sea-thongs*) abounds. It frequently completely covers the long, strap-shaped receptacle of that plant for the space of several inches, forming swellings of a dark colour and very slippery surface.

64. **pulvinata** (*The cushioned Elachista*); tufts very minute, globose; filaments fusiform, much attenuated toward both ends, the basal joints 3–4 times, the middle once and a half, the apical about as long, as broad; spores linear-obovate, subsessile at the base of the filaments, *Harv. Phyc. Brit. Syn. p.* 7. (Atlas, Pl. XVI. Fig. 66.)

Hab. South of England. At Elberry Cove, Torbay. Parasitical on the fruiting branches of *Cystoseira ericoides*. Annual. Summer and autumn.

In a delightful excursion, made in the autumn of 1844, in company with my valued friend Mrs. Griffiths, to visit the habitat of *Gigartina Teedii* at Elberry Cove, we observed that most of the fronds of *Cystoseira ericoides*, which grows in great luxuriance on an exposed rock in the cove, were infested with this minute parasite. The size and shape of the filaments readily distinguish it from any of the British *Elachistæ;* but in these characters it agrees with *E. rivulariæ*, Suhr., from which it is chiefly distinguished by the globose form of the tuft.

65. **velutina** (*The velvety Elachista*); spreading in thin, indefinite, velvety patches; filaments very minute, equal in diameter throughout, dissepiments slightly contracted; joints once to one and a half times as long as broad; spores elliptical, pedicellate, affixed to the lower part of the filaments, *Fries, Flor. Scan.* 317. (Atlas, Pl. XVI. Fig. 67.)

Myrionema velutinum, *Endl.* Sphacelaria? velutina, *Grev.*

Hab. Atlantic coasts of Britain. Parasitical on *Himanthalia lorea*, frequent.

Elachista velutina occurs commonly on the long strap-shaped receptacles of *Himanthalia lorea;* but I have not seen it on *Fucus serratus*. Mr. Ralfs, who finds it abundantly on the *Himanthalia*, remarks that it very frequently accompanies *E. scutulata*, and often so closely resembles that species that it becomes difficult to distinguish them, except by the form of the spores. Usually, however, *E. scutulata* is readily known by occurring in raised, oval, shield-like patches.

XXXI. MYRIONEMA.

66. **strangulans** (*The choking Myrionema*); patches convex, confluent, brown; the vertical filaments clavate, densely set; spores obovate, on short stalks, attached to the decumbent filaments, *Grev. Crypt. Fl. t.* 300. (Atlas, Pl. XVI. Fig. 68.)

Hab. Probably widely dispersed. Parasitical on the fronds of various *Ulvæ* and *Enteromorphæ*. Annual. Summer and autumn.

M. strangulans abounds on all our coasts, and will always afford the possessor of a microscope an interesting subject for examination. The dark-brown specks on the fronds of *Enteromorphæ* and *Ulvæ*, which look like incipient decay, are very often caused by the growth of our parasite, and their colour will direct the most unexamining eye to them. I have generally found the plant in a perfect state in summer and autumn, but specimens may be found at most seasons.

67. **Leclancherii** (*Leclancher's Myrionema*); patches orbicular, thin, and with few vertical filaments toward the edges, convex with crowded filaments in the centre; spores on long pedicels affixed to the decumbent filaments, obovate, *Harv. Phy. Brit. pl.* 41 *a*. (Atlas, Pl. XVI. Fig. 69.)

Rivularia Leclancherii, *Chauv.*

Hab. On decaying fronds of *Rhodymenia palmata*, probably common. Annual. Autumn.

In autumn the fronds of the common *Dulse* (*Rhodymenia palmata*) in passing to decay are commonly found covered with roundish olive spots, which, by a hasty observer may be overlooked as being nothing more than incipient mortification. By placing a small portion of such a spotted frond under the microscope, the beautiful parasite here figured is brought to light. It is nearly related in structure to *M. strangulans*, but differs something in habit, forming a much larger and thinner spot on the fucus.

68. **punctiforme** (*The dot-like Myrionema*); patches globose; filaments tapering to the base; spores linear-obovate, affixed to the vertical filaments near their base, *Harv. in Hook. Br. Fl. v.* 2. *p.* 391. (Atlas, Pl. XVI. Fig. 70.)

Linkia punctiformis, *Lyngb.*

Hab. Shores of Europe. Parasitical on the *Floridęæ*. Annual. Summer and autumn.

This little parasite is obviously nearly akin to the preceding, from which its globose fronds or patches and more

narrow spores distinguish it. It comes nearer to *M. strangulans*, but differs in the position of the spores. The only specimens which I have seen were collected by Mrs. Griffiths several years ago. They were found on *Ceramium rubrum*, which they covered nearly as closely as the warts of fructification cover *Stilophora rhizodes*. Probably it may be found on many of our coasts.

69. **clavatum** (*The clubbed Myrionema*); "very minute, rather convex; filaments clavate, mostly bifid; spores obovate, pedicellate, affixed to the filaments," *Harv. in Hook. Br. Fl. v.* 2. *p.* 391. (Atlas, Pl. XVIII. Fig. 75.)

Linckia clavata, *Carm.*

Hab. On a thin purple cartilaginous crust, probably a *Verrucaria*, which covers the pebbles at the half-tide level. Autumn.

Of this curious little parasite I know nothing more than is learned from the above short description, which, with the figure, is copied from Capt. Carmichael's manuscripts.

Order 6. *ECTOCARPACEÆ.*

XXXII. CLADOSTEPHUS.

70. **verticillatus** (*The whorled Cladostephus*); branches slender; ramuli mostly forked, regularly whorled, the whorls at short intervals, *Ag. Syn. Int. p.* xxv. (Atlas, Pl. XIV. Fig. 58.)

Cladostephus myriophyllum, *Ag.* Ceramium verticillatum, *DC.* Conferva verticillata, *Lightf.* C. myriophyllum, *Roth.* C. ceratophyllum, *Roth.* Fucus verticillatus, *Wulf.*

Hab. On rocks, stones, and corallines, within the influence of the tide. Perennial, fruiting in winter.

A well-known species, abundant on most of the shores of Europe, and found, according to Martius, in Brazil. It was originally described by Lightfoot, whose excellent specific name I retain in preference to that of Roth, conferred nearly thirty years subsequently, and which is universally adopted on the Continent. What I consider fruiting ramuli are regarded by Italian authors, the accurate and acute Meneghini included, as a parasitical plant.

71. **spongiosus** (*The spongy Cladostephus*); branches thick and clumsy; ramuli mostly simple, sometimes forked, irregularly whorled and densely imbricated, *Ag. Syst. p.* 168. (Atlas, Pl. XVII. Fig. 71.)

Cladostephus laxus, *Fl. Dan.* Conferva spongiosa, *Huds.* Fucus hirsutus, *Linn.*

Hab. On rocks and stones in the sea, between tide-marks, and at a greater depth. Perennial. Winter. Common.

Cladostephus spongiosus, the earliest described species of the genus, differs from *C. verticillatus*, more by its smaller size, more clumsy and somewhat flexuous branches, and more closely imbricated ramelli, than by any more definite character. The distinction in the ramelli, noticed in the specific phrase by most authors, is not constant, for these are often forked in the present species, though more usually simple. The colour is darker than that of *C. verticillatus*, and, on the whole, the present is a much less elegant plant. *C. spongiosus* is a very common plant throughout the Atlantic and Mediterranean Seas.

XXXIII. SPHACELARIA.

72. **Filicina** (*The Fern-like Sphacelaria*); frond shaggy at the base, slender, irregularly branched; branches lanceolate, erecto-patent, bi-tri-pinnate; pinnæ alternate, erect; pinnules multifid, lanceolate; axils all very acute and narrow, *Ag. Syst. p.* 166. (Atlas, Pl. XVII. Fig. 72.)

Sphacelaria hypnoides, *Grev.* S. simpliciuscula, *Ag.* Halopteris filicina, *Kütz.* Ceramium filicinum, *Gratel.*

Hab. Southern shores of England. On rocks and nullipores near low-water mark, and at the roots of *Laminaria*, etc. Very rare. Perennial. Fruiting in winter.

There are few more beautiful plants among the filiform Algæ of our coasts, and not many more rare than this, which, though found in several distant localities, is nowhere abundant in Britain. It is indeed a species of the south of Europe which finds its northern limit in our seas, where it does not reach much more than half the size that it attains in the Mediterranean. Specimens from the shores of Italy are nearly as large and bushy as *S. scoparia*, but much more slender in all their parts. Our British individuals, except those from Jersey, are feeble, and have a different aspect. Between the winter and summer states of this species, the differences are so great, that Agardh formerly constituted them two species, his *S. simpliciuscula*, which has its pinnules subsimple, being the winter state of *S. filicina*.

73. **Sertularia** (*The Sertularia Sphacelaria*); frond slightly shaggy at the base, weak and slender, irregularly branched; branches somewhat lanceolate or linear, horizontally patent, tripinnate; pinnæ alternate, divaricate; pinnules very patent,

multifid; axils all very obtuse and wide, *Bonnem. sec. Lenorm. in Herb.* (Atlas, Pl. XVIII. Fig. 76.)

Hab. South of England, and Ireland. Parasitical on various Algæ, in from four to fifteen fathoms water. Very rare. Perennial.

It is, I allow, with some hesitation that I offer a figure of the present plant as anything more than a deep-water variety of *Sphacelaria filicina*, analogous to somewhat similar varieties of several other Algæ, individuals of which, when growing at a more than ordinary depth, differ as much from their normal state, and in a very similar manner, as the present does from *S. Filicina*. Persons accustomed to dredging must be familiar with states of *Plocamium coccineum*, *Dasya coccinea*, etc., which are more slender than the normal form, irregularly branched, with very patent branches and ramuli, and which are usually found entangled with other Algæ, to which they are attached by hooked processes, different from their true roots.

74. **scoparia** (*The broom Sphacelaria*); olive or dark-brown, coarse, the lower part shaggy with woolly fibres; upper branches once or twice pinnated; the pinnæ erecto-patent, awl-shaped, alternate, the lower ones pinnulate, *Lyngb. Hyd. Dan. p.* 104. *t.* 31. *B.* (Atlas, Pl. XVII. Fig. 73.)

Sphacelaria disticha, *Lyngb.* S. scoparioides, *Lyngb.* Ceramium scoparium, *Roth.* Conferva scoparia, *Linn.* C. marina pennata, *Dillen.* Stypopodium scoparium, *Kütz.*

Hab. Atlantic coasts of Britain. On submerged rocks, within and beyond the influence of the tide.

So different from each other are the summer and winter states of this plant that the accurate Lyngbye may well be forgiven for considering them to be distinct species. Few persons, on inspection of our plate in the 'Phycologia Britannica,' would suppose that the bushy and broom-like upper figure was identical in species with the feathery plant represented below; even their microscopic characters are widely dissimilar; yet observation, the true test of species, has traced the one form into the other.

75. **plumosa** (*The feathery Sphacelaria*); filaments naked at the base, elongated, irregularly branched, inarticulate; branches pectinato-pinnate; pinnæ opposite, simple, very long and closely set, *Lyngb. Fl. Dan. p.* 103. *t.* 30. (Atlas, Pl. XVII. Fig. 74.)

Chætopteris plumosus, *Ktz.* Ceramium pennatum, *Fl. Dan.* Conferva pennata, *Smith.*

Hab. On rocks, near low-water mark, and at a greater depth. Perennial.

By earlier writers this beautiful species was confounded with *S. cirrhosa*, of which it was considered to be a luxuriant variety, and in 'English Botany' both are represented on the same plate. Mr. Borrer was, I believe, its first detector in this country, and I am indebted to him for one of the original specimens, gathered at Beachy Head. From *S. cirrhosa* it may always be known, by the different structure of the stem, the closer and more regularly pectinated ramuli, and the greater size. In substance and general habit, *S. plumosa* has very much the appearance of a *Sertularia*, and is almost as rigid. It appears to be peculiarly a northern plant.

76. **cirrhosa** (*The hair-like Sphacelaria*); parasitical; filaments naked at the base, short, densely tufted, simple or branched, jointed throughout; stem, or branches, pinnate; pinnæ opposite, alternate, or irregular, of unequal length; utricles sessile or shortly stalked, scattered, globose, *Ag. Syst. Alg. p.* 164. (Atlas, Pl. XVIII. Fig. 77.)

Sphacelaria pennata, *Lyngb.* Ceramium cirrhosum, *Hook.* Conferva cirrhosa, *Roth.* C. intertexta, *Roth.* C. pennata, *Huds.*

Hab. Parasitic on the smaller Algæ, between tide-marks. Perennial? Summer. Very common.

Here we have a very common and very variable plant, which puts on several distinct-looking forms, according to the locality in which it may grow; but, on a careful examination of numerous specimens of these varieties now before me, I cannot fix on any characters which appear of specific value. The species was once confounded with *S. plumosa*, but differs from that beautiful plant in habit and size, in its jointed main filaments, and in being far less regularly pectinato-pinnated, with proportionally shorter pinnules. Being a very common plant, it was among the first of the genus observed by botanists, and is figured in the 'Historia Muscorum' of Dillenius, under the specific name here preserved.

77. **fusca** (*The brown Sphacelaria*); filaments densely tufted, capillary, brown, distantly and irregularly branched; branches long and simple, bearing a few clavate or three-forked, minute ramuli; articulations twice as long as broad, marked by a transverse band; spores globose, *Ag. Sp. Alg. v.* 2. *p.* 34. (Atlas, Pl. XVIII. Fig. 78.)

Conferva fusca, *Huds.*

Hab. Wales and south of England. On rocks and stones, between tide-marks. Very rare.

Dillwyn, on whose authority the *Sphacelaria fusca* chiefly rests, gives several stations for it, on the coast of Wales, where it would seem to be pretty common. But except a single specimen sent to me several years ago by Mrs. Griffiths, and another more recently received from Mr. Ralfs, I have seen nothing of the plant; nor am I aware of any other author having found it. As a species, *S. fusca* (or what I take for it) differs from *S. cirrhosa* by its irregular branching, by the remarkable cruciform scattered ramuli, and something in colour and in the length of the joints. *S. cirrhosa* is parasitical on other Algæ; but too little is yet known of the history of *S. fusca* to say that it is *not* so. No foreign author appears to be acquainted with the plant.

78. **radicans** (*The rooting Sphacelaria*); filaments erect, or decumbent, sending out a few fibrous radicles from the lower part, sparingly branched; branches alternate, simple, very erect, straight, bare of ramuli; utricles clustered, sessile, globose, *Harv. in Hook. Br. Fl. v. 2. p.* 324. (Atlas, Pl. XVIII. Fig. 79.)

Sphacelaria olivacea, *Ag.* Conferva radicans, *Dillw.* C. olivacea, *Dillw.*

Hab. North of Scotland and Ireland. On sand-covered rocks, between tide-marks. Perennial? Autumn. Rare.

A minute species, one of the least developed of the genuine members of the genus, and more remarkable for its rarity than its beauty. Specimens slightly differing in character, gathered in Orkney by Messrs. Hooker and Borrer, have received the name of *olivacea:* and thus two species have generally been recognized. A careful comparison of the characters attributed to each, with an examination of specimens from different localities, has satisfied me that the differences do not warrant the retention of two species, and I consequently unite the *S. olivacea* of authors to the older *S. radicans.* The form to which the name *olivacea* was given is rather more erect, and less disposed to throw out radicles than common; but there are no other characters by which it can be distinguished. The species was first described in the Appendix to Dillwyn's *Conferva.*

79. **racemosa** (*The clustered Sphacelaria*); "an inch in height,

tufted, olivaceous, somewhat rigid, the fronds dichotomous; articulations equal in length and breadth; capsules oval, racemose, pedunculate," *Grev. Scot. Crypt. Fl. v.* 2. *t.* 96. (ATLAS, Pl. XVIII. Fig. 80.)

Hab. Frith of Forth. Very rare.

In this species we have the remarkable fact, occasionally met with in all departments of natural history, of a species distinguished by strongly marked characters having been seen but once, and that in very small quantity. The tuft from which Dr. Greville's figure, and the above description, which I have transferred from his work, were taken, has also served me in making the drawing. The singular grape-like fructification at once marks the species, and on the specimen found almost every thread had more or less numerous clusters. So that it fortunately happens that a small specimen of this rarity is as characteristic as a much larger would be,—no small advantage, when a half-crown would cover all the specimens at present known to botanists.*

XXXIV. ECTOCARPUS.

80. **siliculosus** (*The pod-fruited Ectocarpus*); tufts yellowish or pale olive-green, gelatinous, soft; filaments very slender, excessively branched; ultimate branchlets alternate or secund, attenuated; utricles stalked, subulate, attenuated to a fine point, *Lyngb. Hyd. Dan. p.* 131. *t.* 43. (ATLAS, Pl. XIX. Fig. 81.)

Ceramium siliculosum, *Ag.* C. confervoides, *Roth.* Conferva siliculosa, *Dillw.*

Hab. Parasitical on various marine Algæ, between tide-marks, and in 3–4 fathoms water. Annual. Spring to autumn.

This is one of the commonest species of *Ectocarpus* in the waters of Europe, and is more generally dispersed than most others of the genus. Formerly it was confounded with *E. littoralis*, and is still, by many botanists, regarded as merely a state of that species. The branching and general habit of the two plants are very similar. *E. siliculosus* is however usually more slender, more gelatinous, softer, and more feathery in its ramification. A more absolute distinction lies in the difference of the *fruit*, which

* Since this was written, *S. racemosa* has been found in tolerable plenty in the Frith of Clyde, by Mr. Roger Hennedy, a successful investigator of the Algæ of that estuary.

is here a lanceolate pod, while in *E. littoralis* one or more spores are immersed in the branches, where they sometimes form strings.

81. **amphibius** (*The amphibious Ectocarpus*); tufts short, loose, soft, pale-olive; filaments very slender, subdichotomous; ultimate branches alternate, spreading; articulations two or three times longer than broad; utricles (?) linear-attenuate, spine-like, mostly sessile, scattered, *Harv. Phyc. v.* 1. *p.* 10. (Atlas, Pl. XX. Fig. 85.)

Hab. In muddy ditches of brackish water, near the coast. Tide-ditches, communicating with the Avon, below Bristol.

The occurrence of an *Ectocarpus* in brackish water, though not without precedent, deserves to be recorded, and it is more on that account than because I am certain of the present plant being a good species, that I give it a place in this work. It will be seen that its characters border very closely on those of *E. siliculosus*, from which the usually sessile fructification and the attenuated form of this part chiefly distinguish it. The resemblance is so striking that one is almost disposed to the belief that our *E. amphibius* may be only *E. siliculosus* altered by growing in water which contains a very small quantity of salt.

82. **fenestratus** (*The windowed Ectocarpus*); pale green, very slender, forming small tufts; filaments not much branched; branches distant, alternate, furnished with a few long and simple, alternate ramuli; articulations of the branches twice or thrice as long as broad, pellucid; silicules stalked, scattered, at first clavate, then elliptic-oblong, obtuse, densely striate transversely, and cross-barred, dark-brown, *Berk.; Harv. Man. ed.* 2. *p.* 58. (Atlas, Pl. XX. Fig. 86.)

Hab. Salcombe. Annual. May.

The characters by which this plant is distinguished from others of the genus—namely, simplicity in branching and the peculiar form of the silicule—appear sufficiently well marked; and we may therefore hope that we have here the foundation of a good species which will be detected in other localities, and in greater abundance than has yet been the case. At present I have only seen a single small specimen, or rather half a specimen. In appearance *E. fenestratus* is not unlike many specimens of *E. siliculosus*, but the form of the silicule is very different; and in this character there is a much nearer approach to *E. tomentosus*, a species which, in all other respects, is widely different from *E. fenestratus*.

83. **fasciculatus** (*The fasciculate Ectocarpus*); tufts olivaceous, dense; main filaments not much divided; the branches distant, set throughout with alternate or secund fascicles of subulate ramuli; the ramuli generally secund in each multifid fascicle; silicules sessile, secund, close together, ovate-acuminate or subulate, *Harv. Man. ed.* 1. *p.* 40. (ATLAS, Pl. XIX. Fig. 82.)

Hab. Between tide-marks, on the larger Algæ; most commonly on *Laminaria digitata*.

An exceedingly common species, easily recognized by the dense ramuli, which appear to the naked eye to be tufted, but which are really only closely placed, and secund on the penultimate branchlets. The favourite habitat of *E. fasciculatus* is on the expanded fronds of *Lam. digitata*, where it often fringes the segments in continuous tufts, but it is not confined to that plant, being commonly found also on *L. bulbosa* and on *Himanthalia lorea*, and others of the larger fucoid Algæ. When young and well-grown it is a very handsome species, but soon becomes coarse and ropy, and towards the close of the season is very much infested with Diatomaceous parasites. In North America this species appears to be the most abundant of the genus.

84. **Hincksiæ** (*Miss Hincks's Ectocarpus*); tufted, dark-olive; filaments irregularly and distantly branched; branches flexuous, furnished with secund ramuli pectinated on the upper side; utricles conical, sessile, lining the inner face of the ultimate ramuli, *Harv. Man. ed.* 1. *p.* 40. (ATLAS, Pl. XIX. Fig. 83.)

Hab. Parasitical on *Laminaria bulbosa*. Annual. June.

My first knowledge of this species was from a solitary specimen gathered in 1840 by Miss Hincks, daughter of the venerable and respected Dr. Hincks, of Belfast. Though I had then seen but one specimen, yet so striking were its characters that I did not hesitate to describe it forthwith as a new species. Mr. Ralfs finds that in June, at Mount's Bay, Cornwall, the stems of *L. bulbosa* are almost exclusively infested with it. It is perhaps not uncommon, but without a careful inspection may be overlooked; a pocket lens is, however, sufficient to detect it, the comb-like, often scorpioid ramuli affording an obvious character. When growing, as it sometimes does, mixed with *E. siliculosus*, the brighter and more glossy and softer threads of the latter may be readily discriminated.

85. **tomentosus** (*The woolly Ectocarpus*); filaments very slender, flexuous, irregularly branched, interwoven into a dense, sponge-like, branching frond; utricles stalked, linear-oblong, obtuse, *Lyngb. Hyd. Dan. p.* 132. *t.* 44. (Atlas, Pl. XIX. Fig. 84.)

Ceramium tomentosum, *Ag.* Chantransia tomentosa, *Endl.* Conferva tomentosa, *Huds.*

Hab. Parasitic on *Fucus vesiculosus*, *Himanthalia lorea*, and other Algæ, between tide-marks; occasionally on rocks and stones. Annual. Summer.

From all the British species of *Ectocarpus* this is at once distinguished by a remarkable difference in habit, the filaments being aggregated together, intertwined, and even firmly compressed into a branching frond, which at first sight is not unlike the spongy frond of *Codium*. In some specimens this character is much more strongly developed than in others, the branches in them being singularly rope-like; while in an opposite variety the tips of the filaments and their lateral divisions are so nearly free that the plant assumes quite a feathery aspect. On different parts of the coast this species differs much in size. It appears to flourish best in the north, in muddy, land-locked bays.

86. **crinitus** (*The hairy Ectocarpus*); filaments decumbent, forming extensive stratified tufts, sparingly branched; the branches subsimple, distant, elongated; ramuli few, patent; spores globose, scattered, sessile; articulations twice or thrice as long as broad, *Carm., Harv. in Hook. Br. Fl. v.* 2. *p.* 326. (Atlas, Pl. XXI. Fig. 91.)

Hab. Appin; Devon. On muddy sea-shores. Annual. Summer. Rare.

I am but imperfectly acquainted with this species, which I have only seen in a dry state; and though I have repeatedly examined several parts of specimens collected by Captain Carmichael, I have not been able to detect the fructification described by him, save in a single instance that I chanced upon the young spore represented at fig. 3. The nearest affinity of *E. crinitus* seems to be with *E. pusillus*, which has a nearly similar ramification, but is a smaller plant, and almost always found with fruit.

87. **pusillus** (*The small Ectocarpus*); filaments tufted, interwoven, sparingly branched; branches distant, very patent, flexuous, bearing a few, irregular, patent, flexuous ramuli; spores roundish-oblong, subsessile, frequently opposite, *Griff. in Wyatt, Alg. Danm. no.* 212. (Atlas, Pl. XXI. Fig. 92.)

Hab. South coast of England. Parasitical on several of the smaller Algæ. Annual. Rare.

One of the least beautiful forms of the genus, but not without interest, as a connecting link between the simpler and more branching species. It grows on several of the smaller Algæ, which it clothes with shaggy flocculi, compared to tufts of pale-brown wool. In drying it sometimes assumes a green colour. *Ectocarpus pusillus* is one of those *unobtrusive* plants, if I may so call them, which, unless closely *looked* for, are easily *overlooked*. It is no easy matter, at all times, to recognize the different *Ectocarpi* by the naked eye, and this accounts for so many species of this genus being passed over by persons who are unaccustomed to the microscope.

88. **distortus** (*The distorted Ectocarpus*); filaments very much branched, matted together, dark-brown, angularly bent; branches spreading at very obtuse angles, alternate or secund; ramuli horizontally patent or recurved, scattered, short, spinelike, obtuse; spores obovate, sessile or subsessile, *Carm., Harv. in Hook. Br. Fl. v.* 2. *p.* 326. (ATLAS, Pl. XX. Fig. 87.)

Hab. Appin. Parasitical on the leaves of *Zostera marina*. Annual. Summer and autumn.

A comparison of the figures of this and the following species will enable the student to appreciate the characters of these plants, and, I hope, to discriminate between them. *E. Landsburgii* is not only more thorny in aspect, but is of a far more rigid substance, and much less transparent: nor does it grow in large densely interwoven tufts like *E. distortus*. Both species appear to be of rare occurrence.

89. **Landsburgii** (*Landsborough's Ectocarpus*); filaments dark-brown, tenacious, intricate, much branched; branches irregularly forked, divaricated, zigzag, bristling with numerous short, spine-like, horizontal ramuli; articulations shorter than broad, the endochrome filling the cell, and recovering its shape on being moistened after having been dried, *Harv. Phy. Brit. pl.* 233. (ATLAS, Pl. XX. Fig. 88.)

Hab. Scotland and Ireland. Dredged in deep water, in land-locked bays; rare. Annual. Summer.

The ramification of our *E. Landsburgii* so nearly agrees with that of *E. distortus*, Carm., that I felt disposed, at first, to regard it as that species. But a careful comparison of both plants, placed side by side on the table of the microscope, has convinced me of their perfect distinctness.

In *E. distortus* the endochrome is small, leaving wide dissepiments and colourless borders; the substance is exceedingly tender, and the branches break up into innumerable frustules when remoistened. In fact, it is impossible to trace the ramification, from the extreme *rottenness* of the moistened frond. In *E. Landsburgii*, on the contrary, the endochrome completely fills the cavity; the dissepiments are mere lines; and the substance is exceedingly tough, and may be kept in fresh water for hours or days without injury. *E. distortus* is, too, a littoral species, while our new species has only been found by dredging in deep water. It appears to be of rare occurrence.

90. **littoralis** (*The littoral Ectocarpus*); tufts dense, interwoven, olive-brown or foxy; filaments coarse, much and irregularly branched, the ultimate branchlets patent, alternate, or rarely opposite; masses of fructification imbedded in the substance of the branches, in the form of oblong swellings, *Lyngb. Hyd. Dan. p.* 130. *t.* 42. (Atlas, Pl. XXI. Fig. 93.)

Ectocarpus compactus, *Ag.* E. ferrugineus, *Ag.* Conferva littoralis, *Linn.*

Hab. Parasitical on *Fuci* and *Laminariæ*, within and beyond the influence of the tide. Annual? At all seasons.

One of the commonest of the British Algæ, and widely dispersed along the shores of the ocean of most temperate countries, its specific name *littoralis* is peculiarly applicable. Nor is this shore-plant at all particular in choosing the substances to which it adheres, or the depth of water where it vegetates. It equally infests the *Fuci* which grow between tide-marks, covering with a shaggy brown fleece those that occur near high-water mark, and those that prefer a deeper level, and the *Laminariæ* that are never exposed to the air. It thus extends nearly throughout the whole belt occupied by sea-plants. Nor is it confined to open sea-shores; it frequents estuaries, and ascends tidal rivers for a considerable distance, growing either on *Fucus vesiculosus* or on submerged woodwork, and even on mud. Towards the close of the summer the tufts become detached, and float about in large masses, and at length are stranded in broad belts along the coast.

91. **longifructus** (*The long-fruited Ectocarpus*); tufts large, branching, the divisions feathery; filaments robust, excessively branched, branches mostly opposite, the lesser ones set with short, spine-like, opposite or rarely alternate

ramuli; articulations as long as broad; silicules very long, linear-lanceolate, attenuate, densely striate transversely, terminating the principal branches and ramuli, *Harv. Man. ed.* 2. *p.* 61. (ATLAS, Pl. XXI. Fig. 94.)

Hab. Orkney. Parasitical on Algæ between tide-marks.

Nearly related to *E. littoralis*, rather than to *E. siliculosus*, and differing chiefly in the greater luxuriance of the frond, and the different form of the fructification. The fructification, however, must be regarded more as an exaggeration of that of *E. littoralis* than as essentially different. In *E. littoralis* the apices of the branches grow out beyond the portion converted into fructification, and the latter therefore appears as if it were immersed in the branch; here, when the ramuli are fertile the whole of the upper portion of the ramulus becomes the fruit.

92. **granulosus** (*The granulous Ectocarpus*); filaments olive, the principal divisions slightly entangled; branches free, feathery; the lesser branches and ramuli opposite, spreading; utricles elliptical, dark-coloured, sessile on the ramuli, *Ag. Syst. p.* 163. (ATLAS, Pl. XXII. Fig. 95.)

Conferva granulosa, *E. Bot.*

Hab. English and Irish coasts. On rocks; also on Corallines and various other Algæ, in rock-pools between tide-marks. Annual. May and June. Not uncommon.

A well-marked and large-growing species, by no means uncommon on various parts of the coasts, usually growing on the smaller Algæ in tide-pools, though occasionally flourishing on the fronds of *Laminariæ*. The opposite branches and ramuli, bearing dark-coloured elliptical utricles on their upper side, readily distinguish this plant from any of its British congeners. The species which most nearly approach it, are *E. sphærophorus* and *E. brachiatus*, but both these differ in fructification. In some varieties the ramuli are not regularly opposite.

93. **sphærophorus** (*The warted Ectocarpus*); filaments slender, short, densely tufted, much branched; upper branches patent, opposite or in fours, bearing patent, opposite ramuli; spores globose, sessile, either opposite to each other or to a branchlet, *Carm., Harv. in Hook. Br. Fl. v.* 2. *p.* 326. (ATLAS, Pl. XX. Fig. 89.)

Hab. Parasitical on the smaller Algæ, between tide-marks. Annual. Summer. Rare.

This species is most readily distinguished from the following by the difference in the fruit, the spores in *E.*

brachiatus being lodged in swellings or enlargements of the smaller branches in the axils of the opposite ramuli, and in this being formed by a metamorphosis of the ramuli themselves. It appears by no means indifferent to what plant it attaches its fronds, being very generally found growing on *Ptilota sericea*, though frequently also on *Cladophora rupestris*. Dr. Hooker brought from Cape Horn an *Ectocarpus* (*E. geminatus*) closely resembling this.

94. **brachiatus** (*The cross-branched Ectocarpus*); frond finely tufted, feathery, much branched; the branches free, opposite or quaternate; ramuli opposite, spreading; capsules imbedded in the branches, forming oblong swellings situated on the lesser branches, or in the axils of two opposite ramuli, *Harv. in Hook. Br. Fl. v.* 2. *p.* 326. (Atlas, Pl. XX. Fig. 90.)

Ectocarpus cruciatus, *Ag.* Conferva brachiata, *Eng. Bot.*

Hab. England, and east and south of Ireland. Rare. In ditches of brackish water, among *Enteromorpha compressa;* in the sea, growing on *Rhodymenia palmata.*

In the year 1801, Mr. Dawson Turner, and in 1808, Sir W. J. Hooker, found in ditches of brackish water, by the seaside on the Norfolk coast, a plant of which a figure and description appeared in the 'English Botany' under the name of *Conferva brachiata*. That figure evidently represents a species of *Ectocarpus*, having opposite branches and immersed fruit. The Norfolk plant has not been found of late years, and no specimen now exists in Sir W. J. Hooker's Herbarium. The English Botany plate consequently remained for many years the only record of the species, until Mrs. Griffiths discovered in Torbay the plant of which a figure is now given, possessing apparently the leading or *essential* characters of the Norfolk one, but growing in the open sea, and always as a parasite on *Rhodymenia palmata.*

95. **Mertensii** (*Mertens's Ectocarpus*); distichous; branches opposite, of unequal length, linear, mostly undivided, closely set, throughout their whole extent, with slender, subulate, opposite ramuli; joints of the stem longitudinally striate, transparent, with a central coloured band, rather shorter than their breadth; spores binate, imbedded in the ramuli, *Ag. Sp. Alg. v.* 2. *p.* 47. (Atlas, Pl. XXII. Fig. 96.)

Conferva Mertensii, *E. Bot.*

Hab. On mud-covered rocks and stones, near low-water mark, and at a greater depth. Annual. April and May. Rare; but pretty generally distributed.

This charming plant, one of the rarest and most beautiful of the filiform marine Algæ, in land-locked harbours, attains a very large size, being upwards of a foot in length. In more exposed places it seldom exceeds three or four inches. It is in greatest beauty in April and May, at which time its fronds are glossy, beautifully feathered, and of a clear olive; later in the season it becomes browner, and loses much of the feathery appearance. In some respects it exhibits a transition to *Sphacelaria*, proving the close connection which exists between that genus and *Ectocarpus*, and the little necessity there is for placing them in different families, as is now done by Continental authors.

XXXV. MYRIOTRICHIA.

96. **clavæformis** (*The club-shaped Myriotrichia*); stem densely beset with quadrifarious ramuli, which gradually increase in length from the base upwards, giving the frond a club-shaped figure, *Harv. in Hook. Journ. Bot. v.* 1. *p.* 300. *t.* 138. (Atlas, Pl. XXII. Fig. 101.)

Hab. Parasitical on *Chorda lomentaria*. Annual. Summer.

This curious little parasite, which in some seasons is not uncommon on the fronds of *Chorda lomentaria*, though far less common than the closely-allied *M. filiformis*, I regard as being more nearly allied to *Ectocarpus* than to any other genus, although Endlicher has placed it nearer to *Cladostephus*, to which its quadrifarious ramuli bear some resemblance. In the long hyaline fibres which plentifully clothe it in every state, it is distinct from both. These *fibres* I formerly described as being forked; on a more careful examination I cannot detect this character. They appear to issue indiscriminately from the apices and the lateral sides of the ramuli.

97. **filiformis** (*The thread-like Myriotrichia*); stem filiform, slender, often flexuous or curled, beset at irregular intervals with oblong clusters of short, papillæform ramuli, *Harv. Man. p.* 44. (Atlas, Pl. XXII. Fig. 98.)

Hab. Parasitical on *Chorda lomentaria*, often accompanying *M. clavæformis*. Annual. Summer. Not uncommon.

While in the preceding species the ramuli regularly increase in length from the base upwards, so as to give the frond a club-shaped, or very slender pear-shaped, outline; in this they preserve nearly an equal length in different parts of the frond, and are collected into oblong clusters,

separated by spaces bare of ramuli. In all other respects the two plants closely resemble each other, and as they are frequently found intermixed on the same frond of *Chorda lomentaria*, I formerly regarded the present as merely a state of *M. clavæformis*.

M. filiformis is much the most abundant species, and is indeed very generally to be found clothing the *Chorda*, when the latter grows in small shallow pools, exposed to strong sunlight. In such localities almost every frond of *Chorda lomentaria* is converted into a soft, cylindrical brush, from the multitudes of these little parasites, clothed with their gelatinous, transparent hairs, which, while the plant remains in the water, stand out on every side, keeping each little filament free of its neighbour. When drawn into the air, the whole falls together in a gelatinous mass.

Sub-Class II. RHODOSPERMEÆ.

Order 7. *RHODOMELACEÆ.*

XXXVI. ODONTHALIA.

98. **dentata** (*The toothed Odonthalia*); frond irregularly pinnate; branches linear-oblong, deeply pinnatifid; laciniæ alternate, sharply toothed towards their truncate extremities; capsules and pods clustered, axillary or marginal, *Lyngb. Hyd. Dan. p.* 9. *t.* 3. (Atlas, Pl. XXIII. Fig. 99.)

Rhodomela dentata, *Ag.* Delesseria dentata, *Lamour.* Fucus dentatus, *Linn.* F. atomarius, *Gmelin.* F. pinnatifidus, *Fl. Dan.*

Hab. On rocks in the sea. Perennial. Fruiting in the winter. Abundant.

Odonthalia dentata, which is peculiarly a northern plant, varies very little in the frond, except that some specimens are more luxuriant than others. The mode of branching, and alternate pinnati-section is invariable; but the fructification presents some varieties. In some specimens the stichidia are densely clustered, and, as well as the bunches of capsules, confined to the axils of the segments; in others, both kinds of fruit are scattered along the margin.

XXXVII. RHODOMELA.

99. **lycopodioides** (*The Lycopodium Rhodomela*); frond divided near the base into several long, simple branches, which are densely beset with slender, finely-divided branchlets, mixed with the short, rigid, bristle-like remains of a former series, *Ag. Sp. Alg. v.* 1. *p.* 377. (Atlas, Pl. XXIII. Fig. 100.)

Gigartina lycopodioides, *Lyngb.* Furcellaria lycopodioides, *Ag.* Lophura lycopodioides, *Kütz.* Fucus lycopodioides, *Linn.* Conferva squarrosa, *Fl. Dan.*

Hab. Growing on the stems of *Laminaria digitata.* Perennial. Spring and summer.

The summer and winter conditions of this species are quite unlike each other. Summer plants of the second year have the stems clothed with the remains of old ramuli, besides being feathered with young ones. In some magnificent specimens collected by Mr. Thompson on the Downshire coats,

the frond is twenty inches in length, and the lateral branches from six to fourteen inches long; and Dr. Greville informs me that some of his specimens are of equal size. Nothing can well exceed the beauty of such plants, as they wave freely in the water. Though the common forms of *R. lycopodioides* seem to be very different from *R. subfusca*, specimens are sometimes found which have an intermediate character. The latter is usually a much more branching plant, and is generally found attached to rocks, and its ramuli are much less dense. The microscopic structure in both is very similar. I must conclude by entering a protest against the substitution by Kützing of his name *Lophura*.

100. **subfusca** (*The brownish Rhodomela*); frond filiform, much branched; the branches irregularly divided, clothed with pinnated branchlets, and subulate, simple, scattered or fasciculate ramuli; pinnules subulate; tetraspores contained either in the somewhat swollen ultimate ramuli (in summer), or in proper branching stichidia (produced in winter), *Ag. Sp. Alg. v.* 1. *p.* 378. (Atlas, Pl. XXIV. Fig. 103.)

Lophura cymosa, *Kütz.* Gigartina subfusca, *Lamour.* Sphærococcus subfuscus, *Hook.* Fucus subfuscus, *Woodw.* F. confervoides, *Huds.* F. variabilis, *Good. and Woodw.* F. setaceus, *Wulf.*

Hab. On rocks and shells, in pools between tide-marks; sometimes on the larger Algæ. Biennial or perennial. Spring and summer. Generally dispersed round the coast.

This plant is so different in appearance when collected in summer and in winter, that it may well be taken by the young botanist for two. The summer specimens are well clothed with slender, multifid, and soft ramuli, which lengthen as the season advances, and drop off before winter, leaving bare stems rough with broken stumps. The tetraspores are found either in summer or in winter. At the former season they are simply immersed in the terminal ramuli; at the latter they will be found lodged in small branching stichidia scattered irregularly along the sides of the branches. Except in its much more bushy and branching habit and paler colour, there is a very close resemblance between this and the preceding species.

XXXVIII. BOSTRYCHIA.

101. **scorpioides** (*The scorpioid Bostrychia*); frond filiform,

solid, shrubby, with the tips of the branches rolled inwards, inarticulate, dotted, composed of several concentric layers of oblong, coloured cells, which are gradually shorter towards the circumference. Fructification of two kinds on distinct individuals; 1, "lateral capsules" (ceramidia), *Roth*; 2, tetraspores contained in terminal, lanceolate pods, *Mont.* (ATLAS, Pl. XXXI. Fig. 139.)

Alsidium scorpioides, *J. Ag.* Rhodomela scorpioides, *Ag.* Fucus scorpioides, *Gmelin.* F. amphibius, *Huds.* Plocamium amphibium, *Lamour. Ess. p.* 50.

Hab. Atlantic shores of Britain. On muddy sea-shores, near high-water mark; at the estuaries of rivers; in salt-water ditches and marshes, adhering to the roots of flowering-plants; said also to grow on submarine rocks. Annual? Summer.

A curious plant, interesting because it occurs in situations more nearly bordering on fresh water than are occupied by any other individual of the *Rhodomelaceæ*, a tribe of Algæ peculiarly impatient of fresh water, and which generally grow at a considerable depth; interesting, also, because it forms a connecting link between several genera. Some doubt hangs over the *capsular* fruit of this species, which has only been observed by Roth, if his vague description can be considered conclusive; nor are the *stichidia* of frequent occurrence.

XXXIX. RYTIPHLÆA.

102. **pinastroides** (*The pine Rytiphlæa*); frond terete, irregularly branched; lesser branches pectinato-pinnate; the pinnæ secund, with their apices more or less hooked inwards, *Ag. Syn. p.* 25. (ATLAS, Pl. XXIV. Fig. 104.)

Rhodomela pinastroides, *Ag.* Halopithys pinastroides, *Ktz.* Gigartina pinastroides, *Lyngb.* Ceramium incurvum, *Dec.* Fucus pinastroides, *Gm.* F. incurvus, *Huds.*

Hab. South of England. On submarine rocks, near low-water mark. Perennial. Winter.

This is one of those plants which, abundant along the shores of southern Europe, reaches its northern limit on the south coast of England. We have the high authority of Turner that it occurs in Ceylon and in New Zealand; otherwise I should suspect some mistake in these stations.

103. **complanata** (*The compressed or flattish Rytiphlæa*); frond brown-red, compressed, pinnate or bi-tri-pinnate, the lower pinnæ short or abortive, the upper long, straight, erect,

virgate, once or twice compounded; pinnulæ subulate or bifid, erect, closely set; the axils acute, *Ag. Sp. v.* 2. *p.* 54. (ATLAS, Pl. XXV. Fig. 108.)

Polysiphonia cristata, *Harv.* Fucus cristatus, var. γ, *Turn.* Plocamium cristatum, *Lamour.*

Hab. South of England and Ireland. On the rocky beds of shallow tide-pools exposed at low-water to full sunshine, among *Corallina officinalis*, etc. Perennial? Summer.

A very rare plant on the British shores, though frequent in the south of Europe. Our figure is made from a specimen gathered at Miltown Malbay, where, in one or two stations, I was so fortunate as to meet with this beautiful plant in considerable abundance. It completely clothed the rocky bottom of a tide-pool four or five yards in diameter and from three to six inches in depth. Where the water became deeper the plant disappeared. The species has a structure very similar to that of a *Polysiphonia*, in which genus I formerly placed it. Indeed, except that we have here an external coating of cells, there is nothing to distinguish it from an ordinary *Polysiphonia*.

104. **thuyoides** (*The cypress Rytiphlæa*); stems erect, rising from creeping fibres, terete; below simple, and set with short, spine-like ramuli; above much branched; branches alternate, very erect, bi-pinnate; pinnæ multifid or pinnulate; axils rounded; ceramidia ovate, sessile, densely set, *Harv. in Mack. Fl. Hib. part* 3. *p.* 205. (ATLAS, Pl. XXIII. Fig. 101.)

Grammita rigidula, *Bonnem.*

Hab. In pools left by the tide, growing either on the rocky bottom or on Corallines and other small Algæ. Perennial. Summer. Abundant on the west coast of Ireland.

From *Rytiphlæa complanata* this species may always be known by its darker colour, cylindrical stems, and generally by a narrower frond. In ramification and general habit there is much similarity. The two may sometimes be found growing in close proximity, and even mixed together, but I have generally observed that *R. thuyoides*, which is the stiffest in substance, usually grows in the shallow parts of the tide-pool, sometimes standing out of the water, while *R. complanata* never dries during the recess of the tide. Small specimens of *Polysiphonia nigrescens* much resemble the present species in habit, but are at once known under the microscope by the very different structure of the frond.

105. **fruticulosa** (*The shrubby Rytiphlæa*); the stems diffuse, branched from the base; branches divaricating, pinnato-dichotomous, set in the lower part with short, horizontal, multifid ramuli; in the upper more or less pinnated with larger, similarly divided branchlets; axils rounded; ceramidia ovate, sessile, densely set; tetraspores in distorted ramuli, *Harv. Phy. Brit. pl.* 220. (ATLAS, Pl. XXIII. Fig. 102.)

Polysiphonia fruticulosa, *Spreng.* P. Wulfeni, *Ag.* Hutchinsia fruticulosa, *Ag.* H. Wulfeni, *Ag.* Grammita Wulfeni, *Bonn.* Ceramium Wulfeni, *Roth.* Fucus fruticulosus, *Wulf.*

Hab. In pools left by the tide, growing on the rocky bottom, or on Corallines and other small Algæ. Perennial. Summer. Common on the western and southern shores of the British Islands.

Some specimens of *R. fruticulosa* are very close to some of *R. thuyoides*, and the latter, in like manner, closely approaches narrow states of *R. complanata*. So nearly do they approach, that at one time I regarded them all as merely sportive forms of one species, but this was before I had much opportunity of studying them in a living state. When growing, each possesses characters sufficiently obvious. It is only in a few cases of imperfect or badly dried specimens that the student will find it difficult to decide to which species the specimen should be referred. The ceramidia of this species are not often found, but when they occur they are generally formed in profusion, almost every twig bearing one or two. They are always borne on less luxuriant specimens than those which yield tetraspores.

XL. POLYSIPHONIA.

106. **urceolata** (*The pitchered Polysiphonia*); filaments rigid, setaceous, full-red, much branched, loosely bundled; branches dichotomous, more or less furnished with short, alternate, patent or recurved ramuli; articulations marked with two broad tubes, those of the main branches 3–5 times longer than broad; siphons four, surrounding a minute cavity; capsules pitcher-shaped, with a produced mouth, generally stalked; tetraspores in the upper part of the ramuli, *Grev. Fl. Edin. p.* 309. (ATLAS, Pl. XXV. Fig. 109.)

Polysiphonia patens, *Harv.* Hutchinsia urceolata, *Hook.* H. patens, *Ag.* Conferva urceolata, *Dillw.* C. patens, *Dillw.*

Hab. Atlantic shores of North Britain. On rocks near low-water mark, and on the stems of *Laminaria digitata.*

Annual. Summer. Common on the shores of the British Islands.

This species is subject to some minor variations, according to the locality in which it grows. When found on rocks, in exposed situations, near low-water mark, the filaments are more robust, of greater length, and much more branching. When growing on the stems of *Laminaria digitata* the filaments are much less branched, the lateral branches shorter, and the ramuli remarkably squarrose, often hooked backwards. To the naked eye the extreme states of these two varieties are sufficiently characterized, but various intermediate forms insensibly connect them.

107. **formosa** (*The beautiful Polysiphonia*); filaments exceedingly slender and flaccid, full-red, much divided; branches subdichotomous, long, flexuous, more or less furnished with scattered, spreading, alternate, subulate ramuli; articulations marked with two broad tubes, those of the main branches many times (5–10 times) longer than broad, of the ramuli short; siphons four, surrounding a minute cavity; capsules urceolate, generally stalked; tetraspores imbedded in the middle part of the ramuli, *Suhr. Bot. Zeit.* 1831, *p.* 709. (Atlas, Pl. XXV. Fig. 110.)

Polysiphonia gracilis, *Grev.*

Hab. Atlantic shores of North Britain. On rocks, near low-water mark. Annual. Summer. Not uncommon.

P. formosa differs from *P. urceolata* chiefly in the much greater tenuity of its filaments, and the greater proportional length of its joints; it agrees with that species in its colour, its ramification, and the peculiar form of its capsules. One appears to be a plant of bays and estuaries; the other, of the more exposed parts of the coast.

108. **pulvinata** (*The cushioned Polysiphonia*); filaments rising from a mass of creeping fibres, tufted and interwoven, short, very slender, flexuous, sparingly and irregularly dichotomous, more or less furnished with very patent or recurved, simple ramuli; articulations of the main branches three or four times as long as broad, of the ramuli very short, four-tubed; capsules urn-shaped, stalked, *Spreng. Syst. Veg. v.* 4. *p.* 350. (Atlas, Pl. XXV. Fig 112.)

Polysiphonia macrocarpa, *Harv.* Hutchinsia pulvinata, *Ag.* Conferva pulvinata, *Roth.*

Hab. On rocks in the sea, between tide-marks. Annual. Not uncommon.

This resembles *P. urceolata* in miniature, but has the soft substance of *P. fibrata*, and is a much more slender plant.

109. **fibrata** (*The fibred Polysiphonia*); stems setaceous below, much attenuated upwards, flaccid, gelatinous, simple or alternately branched, bearing at greater or less distances, dichotomously divided, more or less pencilled ramuli, whose tips are fibrilliferous; axils patent; articulations bistriate, variable in length, those in the principal branches four to six times longer than broad; siphons four, surrounding a minute central cavity; capsules ovate, usually pedunculate, *Harv. in Hook. Br. Fl. v. 2. p.* 329. (ATLAS, Pl. XXVI. Fig. 113.)

Hutchinsia allochroa, var., *Ag.* Conferva fibrata, *Dillw.*

Hab. Atlantic shores of Britain. On rocks, mussel-shells, etc., near low-water mark, either in tide-pools or exposed places. Annual. Summer and autumn. Frequent on the British coasts.

This species is pretty generally dispersed on the British coasts, and must be regarded as one of our commonest species of *Polysiphonia*. The dichotomous fibres which terminate the branches of our *P. fibrata*, and which have given it its name, are by no means peculiar to it; but are equally characteristic of the young state of most, if not all, the species of the genus. On some they are found more abundantly and more fully developed than on others, and in the present plant this is remarkably the case. It is to these fibres the *antheridia* are attached, which on *P. fibrata* are frequently in great abundance, crowning every branchlet with a tuft of golden pods.

110. **spinulosa** (*The finely-spined Polysiphonia*); "dark red; branches divaricate, somewhat rigid, the ramuli short, straight, subulate, divaricate; articulations about equal in length and breadth, three-tubed; tubercles" (young ceramidia) "globose, sessile, excessively minute," *Grev. Scot. Crypt. Fl. t.* 90. (ATLAS, Pl. XXVI. Fig. 114.)

Hab. Appin (probably in tide-pools). Very rare.

One of our rarest species, only found by Captain Carmichael, and by him only once, and now figured from a specimen preserved in the Hookerian Herbarium. The resemblance between *P. spinulosa* and our *P. Carmichaeliana* is great, but *P. spinulosa* is a much smaller and more delicate plant, and its stems are articulated throughout. The "tubercles" are evidently young ceramidia; the spe-

cimen having been collected just as they were putting forth. It is obvious that they are metamorphosed ramuli, occupying exactly the position of ramuli. They are profusely scattered over all the branches of the specimen.

111. **Richardsoni** (*Richardson's Polysiphonia*); stems cartilaginous, setaceous; branches alternate, elongated, divaricate, beset in the upper part with very patent, straight, subdichotomous ramuli; articulations of the stem and branches two or three times longer than broad, irregularly veined; of the ramuli shorter; capsules sessile, globose, *Hook. Br. Fl. v. 2. p.* 33. (ATLAS, Pl. XXVI. Fig. 115.)

Hab. Colvend, Dumfries. Very rare.

What little is known of this species, if it be entitled to that rank, is taken from a specimen gathered by Sir J. Richardson many years ago, before the Arctic Expedition which he accompanied, and preserved in Sir W. J. Hooker's rich Herbarium. Though it closely borders in its microscopic characters on several species, its habit does not precisely agree with any with which I am acquainted. The nearest in affinity is perhaps *P. fibrillosa*, and it is possible that it may be only an anomalous form of that very variable species, from the normal state of which its clearly articulate stem affords a ready distinctive character. The habit of branching strikingly reminds us of *P. elongella*, but in no other character does it agree with that species. There is also an affinity with *P. violacea* and *P. fibrata*, and especially with *P. Griffithsiana;* but from all these it differs in more or less degree, and with none, except the last, has it a very strong relation.

112. **Griffithsiana** (*Mrs. Griffiths's Polysiphonia*); stem rigid, attenuated, alternately branched; branches long, patent, subsimple, furnished with numerous subdichotomous or alternately divided, slender, patent, flaccid ramuli; articulations of the stem, branches, and ramuli about once and a half or rarely twice as long as broad, with straight tubes; siphons in the stem four, with four alternate secondary ones; capsules broadly ovate, sessile, *Harv. Man. p.* 91. (ATLAS, Pl. XXVI. Fig. 116.)

Hab. South coast of England. On the smaller Algæ between tide-marks. Annual. September.

An elegant plant, with a good deal the habit of small specimens of *P. violacea*, but known at once from that species by the distinctly jointed stem marked by straight

tubes. It moreover resists the action of fresh water for a longer time, and the colour is also different. Some specimens of *P. elongella* have a slight look of our plant, but usually their peculiar ramification sufficiently marks these species.

113. **elongella** (*The divaricate Polysiphonia*); filaments setaceous and rigid below, gradually attenuated upwards, irregularly dichotomous, with very patent axils; upper branches flaccid, more or less furnished with lateral, pencilled, multifid, rose or blood-red ramuli; articulations of the branches about as long as broad, those of the ramuli rather longer, both marked with 2–3 broad, parallel, oblong cells; primary tubes four, surrounding a minute cavity, and encompassed with an external coat of small cells; capsules ovate, on a short stalk; dissepiments pellucid, *Harv. in Hook. Br. Fl. v. 2. p.* 334. (Atlas, Pl. XXVI. Fig. 117.)

Hab. On rocks and stones, and on the smaller Algæ, near low-water mark, and at a greater depth. Biennial. Spring and summer. Rather rare.

The winter and summer aspects of a deciduous tree are not more different from each other than are specimens of this beautiful plant collected at opposite seasons. Our figure represents it when in perfection, as it is in spring and in the early months of summer, when its branches are clothed with abundant pencils of delicate rosy or blood-red ramuli. At a later period of the year these fall away, and the specimens collected in September or October are usually quite bare, the larger branches only remaining; and these in their nakedness and rigidity, with broken points and spine-like divaricating branches, have little resemblance to the plant of summer. Such specimens as survive the winter throw out with returning spring fresh pencils of branchlets, even in greater profusion than the first year. Such is also the case with *P. elongata*, which our *P. elongella* strongly resembles in miniature, but from which it may readily be known by the pellucid articulations visible in all parts of the plant, and by the ramuli not tapering to the base.

114. **elongata** (*The Lobster-horn Polysiphonia*); stems robust, cartilaginous (rarely gelatinous), irregularly branched, beset, especially towards the tips, with slender, close-set, multifid ramuli, which are attenuate to the base and apex: articulations about as long as broad (the upper ones rarely once and a half to twice as long), those of the stem reticulated with

veins and more or less obsolete, *Harv. in Hook. Br. Fl. v.* 2. *p.* 333. (Atlas, Pl. XXIV. Fig. 105 and 106.)

Polysiphonia Ruchingeri, *J. Ag.* P. rosea, *Grev.* P. stenocarpa, *Kg.* P. chalarophlæa, *Kg.* P. clavigera, *Kg.* Hutchinsia elongata, *Ag.* H. Ruchingeri, *Ag.* Ceramium elongatum, *Roth.* C. brachygonium, *Lyngb.* Conferva elongata, *Huds.*

Hab. Common on stones and shells, in pools between tide-marks, and attached to oyster and scallop-shells, etc., in 5–10 fathoms water. Perennial, or at least biennial. Spring and summer.

Fig. 105 of the Atlas represents the ordinary form of *P. elongata* (*Lobster-horns*) in plants of the first season, and Fig. 106 a plant of the second year's growth. In winter the tips of the branches and ramuli of the first year fall away, leaving a stunted and broken frond, very unsightly, and often distorted. Early in spring, new growth commences; the broken branches put forth vigorous shoots, ending in broad pencils of crimson ramuli, which in a short time clothe the whole upper part of the frond in the rich costume which we have endeavoured to portray. These different aspects of the species are puzzling to a young observer.

115. **violacea** (*The violet Polysiphonia*); brownish-red or purple; stem inarticulate, marked with irregular cells, rather robust, alternately branched; branches quadrifarious, decomposed, bushy or feathery, the ultimate ramuli exceedingly slender, alternately multifid, fibrilliferous; articulations of the ramuli bi-striate, two to four times longer than broad; siphons four; capsules ovate, pedicellate or sessile; tetraspores in swollen, sub-moniliform ramuli, *Grev.; Wyatt, Alg. Danm. no.* 176. (Atlas, Pl. XXVII. Fig. 119.)

Hutchinsia violacea, *Ag.*

Hab. Shores of North Britain. On rocks and stones, and on the smaller Algæ, near low-water mark. Annual. May and June. Not uncommon.

A very beautiful species, in many respects resembling *P. fibrata*, especially in the appearance that small portions present to the microscope; but this is a much larger and more luxuriant plant, and readily and clearly distinguished by the opaque stem, coated with short, irregular cells. In some specimens the byssoid ramuli are much developed, and of a beautiful violet colour, especially when dried; in others they are far shorter, and the frond has a more bushy appearance. In a young state the tips are found clothed with fibres, but these are rarely seen in the more advanced stages of growth.

116. **Carmichaeliana** (*Carmichael's Polysiphonia*); stem inarticulate, percurrent, flexuous, rigid, set throughout with lateral, alternate, inarticulate, divaricating branches; ramuli scattered, very patent, irregularly forked, articulate; articulations as long as broad, three-tubed, *Harv. in Hook. Br. Fl. v.* 2. *p.* 328. (Atlas, Pl. XXVI. Fig. 118.)

Polysiphonia divaricata, *Carm.*

Hab. Appin. Parasitical on *Desmarestia aculeata.* Very rare.

No one but Carmichael has met with this plant, to my knowledge, and he only found it once. Its characters are so peculiar that I formerly considered myself justified in assigning it a specific name. How far I acted wisely may be questioned. At any rate, as it has borne a name in British works for many years, it is right that it should now be figured, that persons visiting the western shores of Scotland may look out for it. Rigid and spiny as it looks, I have sometimes thought that it may be only an extravagant form of *Pol. fibrillosa.* The specimen is preserved in the herbarium of Sir W. J. Hooker.

117. **fibrillosa** (*The fibrillose Polysiphonia*); pale straw-colour or brownish; stems inarticulate, opaque, with sinuous veins, robust, alternately branched; branches spreading, resembling the stem, but less opaque, articulated towards the apices, subsimple, thickly set with very slender, articulated, finely divided, short ramuli, whose tips are copiously fibrilliferous; articulations of the ramuli rather longer than broad, 2–3-striate; siphons four, in the stem surrounded by a thick wall of small cells; capsules broadly ovate; tetraspores large, in distorted terminal ramuli, *Grev.; Harv. in Hook. Br. Fl. v.* 2. *p.* 334. (Atlas, Pl. XXVIII. Fig. 123.)

Hutchinsia fibrillosa, *Ag.* H. lubrica, *Ag.* H. pilosa, *Nacc.* Conferva fibrillosa, *Dillw.*

Hab. Atlantic shores of Britain. On rocks and stones, and on Algæ, chiefly in clear, sunny pools left by the falling tide. Annual. Summer.

A common plant, subject to many variations in form, but generally recognized by its somewhat clumsy, unjointed stems, and short, soft, and gelatinous ramuli copiously fibrillose at the tips. It is most nearly related to *P. violacea*, with which alone can it well be confounded, and from which it chiefly differs in its shorter and less multifid ramuli, duller colour, and shorter articulations; but there are specimens occasionally found which seem almost to connect these two species together.

118. **Brodiæi** (*Brodie's Polysiphonia*); stems inarticulate, robust, cartilaginous, alternately branched; branches virgate, clothed with spreading, pencilled, multifid, delicate, flaccid ramuli; articulations of the ramuli three or four tubed, rather longer than broad; siphons in the stem about seven, surrounding a narrow cavity; capsules ovate, pedicellate, or subsessile; tetraspores in the swollen tips of the multifid ramuli, *Grev.; Harv. in Hook. Br. Fl. v. 2. p.* 328. (Atlas, Pl. XXVII. Fig. 120.)

Hutchinsia Brodiæi, *Lyngb.* H. penicillata, *Ag.* Conferva Brodiæi, *Dillw.* Ceramium Brodiæi, *Ag.*

Hab. Common on the rocky shores of Scotland; of the south of of England, and south and west of Ireland; and of the Channel Islands. On rocks and Corallines near low-water mark. Annual. Summer.

This is one of the handsomest, as it is one of the largest of the British species of *Polysiphonia*, and easily recognized, except occasionally from some specimens of *P. fruticulosa*, by its peculiar habit. The inarticulate stem, and long, simple, robust branches clothed with pencils of delicate filaments, strongly mark the species. *T. Brodiæi* is now ascertained to be common on all the northern shores of Europe as well as on the eastern shores of North America.

119. **variegata** (*The variegated Polysiphonia*); filaments brownish-purple or greenish, setaceous, and rigid below, gradually attenuated upwards to a capillary fineness, dichotomous, the lower axils very patent; branches somewhat zigzag, elongated, much divided, set with lateral, capillary, and very flaccid, multifid, purple ramuli; articulations near the base shorter than their breadth, twice as long as broad in the principal branches, and gradually becoming shorter upwards, marked with three broad, parallel, oblong cells, separated by pellucid spaces; tubes six or rarely seven, surrounding a minute cavity; capsules ovate, on a short stalk, *J. Ag. Alg. M. p.* 129. (Atlas, Pl. XXVIII, Fig. 124.)

Polysiphonia peucedanoides, *Mont.* Hutchinsia variegata, *Ag.* Gramita peucedanoides, *Bonnem.*

Hab. On mud-covered rocks in bays and estuaries, also on *Zostera*, *Chorda filum*, floating timber, etc. Annual. Summer and autumn. Various places near Plymouth. Very local.

No species need be more distinct than this is. Its habit is very like that of *P. elongella*, it is true, but the purple colour affords an obvious character; while the *six tubes* of the stem furnish an important distinction from that and all other British species yet known. The favourite locality

of this plant seems to be mud-banks or mud-covered rocks. It requires some algological zeal to hunt over such ground, which, to many collectors, would appear little likely to yield anything so beautiful; yet such ground is very favourable to the growth of many of this genus, and of the finest *Callithamnia*. At Venice it is the commonest of the genus; but Venetian specimens are greatly inferior in size and beauty to some of their Plymouth brethren. Those which I have received from Dr. Bailey of New York are nearest to the luxuriance of the latter.

120. **obscura** (*The dusky Polysiphonia*); densely matted together, filaments creeping, throwing up erect, simple, secund branches, which are either naked or furnished with a few secund ramuli; articulations as long as broad, many-tubed, *J. Ag. Alg. Medit. p.* 123. (Atlas, Pl. XXV. Fig. 111.)

Hutchinsia obscura, *Ag.* Conferva intertexta, *Roth.*

Hab. Jersey and Sidmouth. Spreading over marine rocks, at half-tide level; also parasitical on *Fuci*, and on some of the smaller Algæ.

I had at first confounded this plant with *P. secunda*, Mont., a plant to which, outwardly, it bears a strong resemblance, but from which it differs in length, and composition of the articulations. I have now minutely compared the British specimens with one of *P. obscura* received from Prof. J. Agardh, and find them to agree in all essential particulars; ours are, however, rather more robust than the Adriatic plant, and the joints slightly shorter.

121. **simulans** (*The deceptive Polysiphonia*); filaments slender, bushy, branched from the base; branches alternate, patent, repeatedly (but irregularly) pinnate; the penultimate branches long and simple, set with short, distant, spine-like ramuli; articulations of the branches once and half as long as broad, of the ramuli shorter, many-tubed; siphons about twelve; ceramidia globose or ovate, *Harv. Man. ed.* 2. *p.* 89. (Atlas, Pl. XXVIII. Fig. 125.)

Polysiphonia spinulosa, *Griff.* P. divergens, var., *Ktz.*

Hab. Jersey, Torquay, Orkney. On rocks, etc., in tide-pools near low-water mark. Annual? Summer. Rare.

By comparing the figure of this species with that of *P. subulifera*, it will be seen that there is a very near relationship between them, and, except for some differences of habit and minor differences in structure, the two might perhaps be brought together. Prof. J. Agardh, however,

who saw specimens of our *P. simulans* during his visit to England, pronounced them distinct, an opinion also entertained by Mrs. Griffiths, and in which, though not without misgivings, I concur.

122. **nigrescens** (*The blackish Polysiphonia*); fronds robust, rigid, and generally rough with broken branches below, much branched and bushy above; the branches alternate, repeatedly divided in a pinnate manner; ramuli distant, elongated, awl-shaped, alternate, the upper ones sometimes having a few processes near the tips; lower articulations short, upper rather longer than broad; siphons about twenty, surrounding a large tube; ceramidia broadly ovate, sessile or nearly so, *Harv. in Hook. Br. Fl. v.* 2. *p.* 332. (Atlas, Pl. XXVII. Fig. 121.)

Polysiphonia fucoides, *Grev.* Hutchinsia nigrescens, *Lyngb.* H. fucoides, *Hook.* Conferva nigrescens, *Huds.* C. fucoides, *Huds.*

Hab. On rocks and stones, and attached to Algæ, etc., between tide-marks. Perennial? Summer. Abundant.

This species varies considerably in appearance according to the time of year at which the specimens are collected, the autumnal or winter individuals being coarse and bushy, with crowded ramuli, while those gathered in spring and summer are of the feathery character represented in our figure. Some are of a dark-purple, and others are of a dull-brown, or pale; but all become much darker and even black in drying. From all the British species of the section to which it belongs, *P. nigrescens* may be known by the distantly pinnated ramuli, the very large number of siphons, and the comparatively wide central tube. When bearing antheridia, the tips of the branches are yellow.

123. **affinis** (*The allied Polysiphonia*); filaments robust, elongated, cartilaginous below, flaccid above, irregularly divided; branches patent, naked at base, multifid, and with an ovate outline above; ramuli very erect, simple or divided, acute; articulations multistriate, the lower two or three times longer, the upper as long as broad; siphons about sixteen; ceramidia ovate, stalked or subsessile, *Moore in Ord. Surv. Londonderry, Appendix, p.* 11. *t.* 7. (Atlas, Pl. XXVII. Fig. 122.)

Hab. Carnlough, near Glenarm, Ireland. On rocks, etc., in the sea, thrown up from deep water.

Very closely related to *P. nigrescens*, from which it chiefly differs in the greater length of the articulations of the stem, rather a variable character; and in the smaller number

of siphons in each whorl. The ramification is somewhat more lax; the spaces of naked branch at the bases of the branching portion are longer; the filaments are more flexuous and flaccid, and the colour is usually paler than in *P. nigrescens*, but there is such a general similarity that I could be well contented to regard it as a deep-water form of that species.

124. **subulifera** (*The subulate Polysiphonia*); filaments setaceous, quickly becoming flaccid, flexuous, irregularly much branched; branches alternately decompounded, spreading, the lesser divisions long and rod-like; ramuli scattered, patent, subulate, simple or rarely bi-multifid; articulations visible in all parts of the frond, variable in length, many-striate; tubes about thirteen, containing a coloured bag, and surrounding a narrow cavity, *Harv. in Hook. Journ. Bot. 1st Series, v.* 1. *p.* 301. (Atlas, Pl. XXIX. Fig. 129.)

Hutchinsia subulifera, *Ag.*

Hab. South of England, and Ireland. Dredged in four to five or ten fathoms water, generally on Nullipore banks. Annual. Summer.

To the naked eye this species bears a greater resemblance to young specimens of *Rytiphlæa fruticulosa* than to anything else, but is more slender and flaccid, and readily known at all times by the distinctly articulate stem and branches, which have, both externally and internally, a very different structure. Its peculiar thorny habit, well expressed by the specific name, is so unlike that of any other British species of equal size, that it cannot well be confounded with any. It appears to be abundant on the coast of Ireland, especially in Roundstone Bay, where on different occasions I have dredged it in considerable quantities.

125. **atro-rubescens** (*The dark-red Polysiphonia*); filaments setaceous, sparingly or much branched, dark brownish-red, somewhat rigid; branches long, alternate, very erect, mostly undivided, usually furnished with a second (or third) set of lesser branches, naked, or clothed with short, simple or multifid, scattered, subulate ramuli, which taper to the base and apex; articulations variable, the lower twice or thrice as long as broad, the upper gradually shorter, marked with several spirally-curved tubes; siphons about twelve; capsules broadly ovate or subrotund, sessile, nearly or quite terminal; tetraspores imbedded in multifid ramuli, *Grev. Fl. Edin. p.* 308. (Atlas, Pl. XXIX. Fig. 130.)

Polysiphonia Agardhiana, *Grev.* P. badia, *Grev.* P. denudata, *Grev.* Hutchinsia atro-rubescens, *Lyngb.* H. Agardhiana, *Ag.* H. badia, *Ag.* H. denudata, *Ag.* Conferva nigra, *Huds.* C. atro-rubescens, *Dlw.* C. badia, *Dlw.* C. denudata, *Dlw.*

Hab. On rocks and stones in the sea, near low-water mark. Annual. Summer and autumn. Not uncommon.

So long a string of synonyms seems to speak of a plant of very variable aspect. Yet the species here figured is tolerably constant to its characters, and much less variable than some others of the genus, about which botanists have had fewer differences. This plant has appeared under *four* names in the works of most authors; the first, *P. badia*, refers to the frond in a half-grown state; *P. atro-rubescens*, to the ordinary form of the full-grown plant; *P. Agardhiana*, to a luxuriant state of the frond, coupled with an imperfect state of capsular fruit; and *P. denudata*, to a battered and denuded state of the frond.

126. **furcellata** (*The forked Polysiphonia*); filaments elongated, tufted, flexuous, repeatedly and closely dichotomous; axils broad, rounded; ramuli erect, their points somewhat hooked in; joints of the stem three to five times longer than broad, *Harv. in Hook. Br. Fl. v.* 2. *p.* 332. (Atlas, Pl. XXVIII. Fig. 126.)

Hutchinsia furcellata, *Ag.* Lamourouxia turgidula, *Bonnem.*

Hab. South shore of England. Annual. Summer. Very rare.

This species, figured for the first time in the 'Phycologia Britannica,' as rare as it is beautiful, till it was recently brought by Mr. Webb from the Canary Islands, was supposed to be confined to the shores of the British Channel. There is no other British species so nearly allied to *P. furcellata* as to be confounded with it, although when examined microscopically we perceive a considerable affinity on the one hand to *P. nigrescens*, and on the other to *P. fastigiata*. Between these two species indeed, *P. furcellata* appears to me to be almost intermediate. The relative length and the structure of the joints are very much those of *P. nigrescens*, from which the dichotomous, not pinnate, ramification, the want of leading stem, bright colour, etc., abundantly distinguish it; while, on the other hand, the ramification nearly approaches that of *P. fastigiata;* but then, the nature of the joints, the colour, and the flaccid substance are very different.

127. **fastigiata** (*The level-topped Polysiphonia*); filaments

rigid, setaceous, of equal diameter throughout, forming globular, fastigiate tufts, many times dichotomous; the axils patent; articulations shorter than their diameter, multistriate, with a dark central spot; siphons from sixteen to eighteen, *Grev. Fl. Edin. p.* 308. (Atlas, Pl. XXVIII. Fig. 127.)

Hutchinsia fastigiata, *Ag.* Ceramium fastigiatum, *Roth.* Conferva polymorpha, *Linn.* Fucus lanosus, *Linn.*

Hab. Parasitical on the littoral *Fuci*, especially upon *Fucus nodosus*. Perennial. Summer and autumn.

P. fastigiata grows nearer to high-water mark than any others of the genus, and is generally exposed, for many hours of each tide, to the influence of the air. This exposure, and the constant alternation of circumstances, probably influence the colour of its frond, and we accordingly find that it partakes of the *brown* tints of the *Fuci* among which it grows, almost to the entire extinction of the red colour proper to the family to which its structure allies it. Besides this difference of colour, it differs from most others of its genus in having a cell, containing endochrome, within each articulation of the central or axial tube.

128. **parasitica** (*The parasitic Polysiphonia*); filaments slender, rigid, full-red, alternately branched, distichous; branches bi-tripinnate; pinnules closely set, erecto-patent, alternate, awl-shaped, acute; articulations about as long as broad, marked with three or four broad hexagonal oblong cells (or siphons) separated by pellucid spaces; siphons about eight, surrounding a narrow cavity; capsules ovate, on short stalks; tetraspores immersed in swollen pinnules, *Grev. Fl. Edin. p.* 309. (Atlas, Pl. XXVIII. Fig. 128.)

Hutchinsia parasitica, *Ag.* H. Möstingii, *Lyngb.* Conferva parasitica, *Huds.*

Hab. Parasitical on the larger Algæ, and, much more frequently, on various species of *Melobesia*, at the limit of low-water, and in from four to fifteen fathoms water.

Polysiphonia parasitica is, I believe, a much more generally distributed species on our shores than is commonly supposed; but owing to its habitat it very frequently escapes detection. Unless it be obtained by dredging, which, in favourable localities, is perhaps the most certain means of procuring specimens, it can only be had by examining the submersed perpendicular sides of ledges of rock, at the extreme limit of low-water. These ledges are frequently coated over with a thin spreading *Melobesia* or with the base of *Corallina officinalis*, on which the *Polysiphonia* grows.

129. **byssoides** (*The byssoid Polysiphonia*); stems rigid, setaceous, cartilaginous, distichously branched, decomposito-pinnate; branches patent, more or less densely clothed with short, slender, dichotomous, single-tubed, byssoid ramelli; articulations of the stem variable in length, 3–4-striate, *Grev. Fl. Edin. p.* 309. (Atlas, Pl. XXX. Fig. 134.)

Hutchinsia byssoides, *Ag.* Conferva byssoides, *Eng. Bot.* Ceramium molle, *Roth.* Fucus byssoides, *Good. et Woodw.*

Hab. On stones and shells, and various Algæ, near low-water mark, and in 4–5-fathoms water.

One of the handsomest of the British species of this extensive genus, especially when young, at which period the whole plant is of the softest substance and most delicate rosy-red colour. In some respects this species connects the genera *Polysiphonia* and *Dasya*, for here, although the tetrasporic fruit is altogether that of a true *Polysiphonia*, the habit of the frond is that of *Dasya*; the byssoid ramelli of this species being identical with those found in the *Dasyæ*. These ramelli appear to be also of the same nature as the fibres found terminating the young branches of other *Polysiphoniæ*, as well as *Rhodomelæ*, etc., and are probably to be regarded as leaves in a very imperfect state of development.

XLI. DASYA.

130. **coccinea** (*The scarlet Dasya*); stems elongate, robust, rough with hair-like fibres, distichously branched; branches bi-tripinnate; pinnulæ multifid, single-tubed, their articulations as long as broad, *Ag. Spec. Alg. v.* 2. *p.* 119. (Atlas, Pl. XXX. Fig. 135.)

Asperocaulon coccineum, *Grev.* Ellisius coccineus, *Gray.* Trichothamnion coccineum, *Kutz.* Hutchinsia coccinea, *Ag.* Callithamnion coccineum, *Lyngb.* Conferva coccinea, *Huds.* C. plumosa, *Ellis.* Ceramium hirsutum, *Roth.* C. patens, *Grev.*

Hab. On rocks and Algæ near low-water mark; β. dredged in deep water. Annual. Summer.

A well-known plant, common along the coasts of Europe, and a great favourite with collectors of Seaweeds for ornamental purposes. By dredging in sandy bays and among *Nullipores* a complete series of forms, connecting the most luxuriant with the most lank, may be collected. Those from deep water are generally very irregularly branched, and seldom produce fruit. Specimens having *stichidia* are

always more slender and delicate than those that bear *ceramidia*.

131. **ocellata** (*The ocellated Dasya*); stems subsimple, beset on all sides with long, erecto-patent, dichotomous, pencilled ramuli; articulations three or four times longer than broad; pods linear-lanceolate, attenuated, tapering to an acute point, *Hrv., Hook. B. F. v.* 2. *p.* 335. (Atlas, Pl. XXXI. Fig. 137.)

Dasya simpliciuscula, *Ag.* Ceramium ocellatum, *Gratel.* Hutchinsia ocellata, *Ag.*

Hab. South of England and Ireland. On mud-covered rocks in the sea; rare. Annual. Summer.

This little plant was first described by Grateloup, in the year 1807, under the specific name which I adopt in preference to that proposed by Agardh twenty years subsequently. By the term *ocellatum*, Grateloup no doubt intended to allude to the eye-like spots caused by the density of the ramuli at the tips of the branches. The branches indeed, when the plant is displayed on paper, resemble delicate feathers, each marked with an eyelet. When growing, Mrs. Griffiths compares them, with equal propriety, to the brushes with which bottles are cleaned.

132. **arbuscula** (*The shrub Dasya*); stems much and irregularly branched, beset on all sides with short, divaricating, dichotomous ramuli, scarcely tapering upwards; articulations from two to four times longer than broad; apices spreading, rather obtuse; stichidia elliptic-oblong, mucronate; ceramidia urceolate, with a long, cylindrical neck, *Ag. Sp. Alg. v.* 2. *p.* 121. (Atlas, Pl. XXXIV. Fig. 153.)

Dasya Hutchinsiæ, *Harv.* Ceramium Boucheri, *Duby.* Conferva arbuscula, *Dillw.*

Hab. On rocks, at the verge of low-water mark; a more slender variety frequently dredged in from four to six or eight fathoms water. Annual. Summer.

There are two principal varieties of this pretty species; one of them found on rocks near low-water mark, the other dredged in deeper water, and often on a sandy or shingly bottom, or among *Zostera*. In the first, which is represented in our figure, the frond is more robust and bushy, the branches more regularly alternate, and the colour frequently very dark. But this last character varies according to minor circumstances of each locality. This variety is frequently found in fruit, the *pods* being more commonly found than the *capsules*. In the second variety the stems are more slender, the branches much divaricated, and the

order of branching more or less dichotomous, while the ramuli are less dense, and more squarrose and, so far as I know, always barren.

133. **venusta** (*The beautiful Dasya*); frond pyramidal, decompoundly pinnate; the branches clothed with exceedingly slender, flaccid, many times dichotomous, attenuated ramuli; articulations five or six times longer than broad; stichidia pedicellate, ovoid, much acuminate; ceramidia ovate-urceolate, with a protruding mouth, *Harv. Phy. Brit. pl.* 225. (Atlas, Pl. XXV. Fig. 107.)

Hab. Jersey. Cast on shore. Annual. Summer and autumn. Very rare.

In the byssoid fineness of its ramuli this species approaches *D. elegans*, but differs in habit and in the form of its *stichidia* and *ceramidia*. Its habit is indeed rather that of *Pol. byssoides* or of *Seirospora Griffithsiana* than of any *Dasya* known to me, and may be said to be intermediate in aspect between those two beautiful plants. The conical outline is very characteristic; but it is on the extreme slenderness and repeated division of the ramuli, and the shape of the stichidia, that I chiefly rely for its diagnosis.

Order 8. *LAURENCIACEÆ.*

XLII. BONNEMAISONIA.

134. **asparagoides** (*The asparagus-like Bonnemaisonia*); frond compressed or sub-terete; capsules stalked, opposite the cilia, *Ag. Sp. Alg. v.* 1. *p.* 197. (Atlas, Pl. XXX. Fig. 133.)

Plocamium asparagoides, *Lam.* Ceramium asparagoides, *Roth.* Fucus asparagoides, *Woodw.*

Hab. On submarine rocks, near low-water mark, and at a greater depth. Annual. June to September.

A highly beautiful species, and so unlike any other British Alga that it must be recognized at a glance. The delicate cilia which border every part of the frond, and which are arranged with strict regularity, being always perfectly distichous, and placed *alternate* to each other and *opposite* either to a capsule or to a branch, taken in connection with the cellular frond and brilliant colour, afford marks that cannot be mistaken.

XLIII. LAURENCIA.

135. **pinnatifida** (*The pinnatifid Laurencia*); frond compressed

or subcylindrical, cartilaginous, bi-tripinnatifid, the divisions alternate; the ultimate ones linear, erecto-patent, simple or lobed, *Lamour. Ess. p.* 42. (Atlas, Pl. XXIX. Fig. 131.)

Chondria pinnatifida, *Ag.* Gelidium pinnatifidum, *Lyngb.* Fucus pinnatifidus, *Gm.* F. multifidus, *Huds.* F. Osmunda, *Gm.* F. filicinus, *Lightf.*

Hab. On submarine rocks, from the extreme of high-water mark to beyond the limit of low-water. Abundant.

Few of the marine Algæ exhibit a greater variety of forms and sizes than this. It commences to grow nearly at high-water mark, covering the rocks with a stunted vegetation, of a yellowish or livid green, scarcely larger than the neighbouring *Lichina pygmæa*, and continues increasing in luxuriance with the increasing depth of water, down to the region of the *Laminariæ*, where it reaches its highest development, and perhaps extends to a greater depth. *Laurencia pinnatifida* has often, though not invariably, a hot and biting taste, and was formerly eaten in Scotland under the name of Pepper Dulse. It does not appear to have ever been in much repute as an article of food, and its use is now rare.

136. **cæspitosa** (*The tufted Laurencia*); frond cylindrical or subcompressed, narrow, repeatedly pinnate, pyramidal; main branches often opposite, erecto-patent; ramuli irregularly scattered, distichous or spreading on all sides, often crowded, erect, slightly tapering to the base, truncate, *Lamour. Ess. p.* 43. (Atlas, Pl. XXXI. Fig. 140.)

Laurencia hybrida, *Lenorm.* L. pinnatifida, var., *Grev.* Fucus hybridus, *DC.*

Hab. On stones and shells, within tide-marks; rarely growing on other small Algæ. Annual. Summer. Common.

This species has been generally considered by British authors to be a variety of the preceding. If we take ordinary specimens of *L. pinnatifida* and compare them with specimens of our present plant, they appear distinct enough; but narrow and ill-grown individuals of the former species come very close, it must be confessed, to the latter. The chief characters of *L. cæspitosa* are a cylindrical frond, with alternate and very erect ramuli. The latter characters and the very lurid colour distinguish it from *L. obtusa.*

137. **obtusa** (*The obtuse Laurencia*); frond cylindrical, filiform, repeatedly pinnate; branches patent; pinnæ and pinnulæ mostly opposite, the ultimate pinnules very short and ob-

tuse, sometimes cruciform, *Lamour. Ess. p.* 42. (ATLAS, Pl. XXIX. Fig. 132.)

Laurencia intricata, *Lamx.* L. gelatinosa, *Lamx.* L. lutea, *Lamx.* L. cyanosperma, *Lamx.* Chondria obtusa, *Ag.* Fucus obtusus, *Huds. Fl. Ang. p.* 586.

Hab. Parasitical on the smaller Algæ between tide-marks. Annual. Summer.

This species is as widely dispersed over the world as *L. pinnatifida*, and though not quite so variable as that plant in general appearance, nevertheless exhibits considerable varieties. This is to be expected in a plant which grows as well in subtropical as in temperate waters; and which even extends within the tropics. On our shores, except in colour, it preserves most of the characters represented in the Plate; but Continental specimens are often much taller in proportion to their breadth, till the pyramidal outline becomes almost as long, in proportion to its base, as an obelisk. When growing in sunny pools the whole plant often becomes pale yellow, preserving merely in the youngest ramuli a rosy hue; but in deeper water, and under the shade of leafy Algæ, all the branches are of a full red.

138. **dasyphylla** (*The thick-leaved Laurencia*); frond cylindrical, filiform, decompound-pinnate or irregularly branched; branches erecto-patent; ramuli short, club-shaped, obtuse, transversely striate, very much attenuated at the base, *Gr. Alg. Br. p.*112. *t.* 14. *f.*13–17. (ATLAS, Pl. XXXII. Fig.144.)

Laurencia cæspitosa, *Lamour.* Chondria dasyphylla, *Ag.* Gigartina dasyphylla, *Lamour.* Fucus dasyphyllus, *Woodw.*

Hab. On stones and shells in pools, near low-water mark, generally where the surface is covered with sand or mud. Annual. Summer. Frequent.

Laurencia dasyphylla belongs to a section of the genus distinguished by having a jointed axis, composed of four or five large cells surrounding a central cavity, exactly as in *Rytiphlæa:* and as these cells are all of equal length, their upper and lower extremities form transverse lines, which, seen through the minute cells of the surface, have the appearance of striæ. In the present species these striæ are at very short intervals. They are much more apparent in the younger parts of the frond, but the structure on which they depend is equally obvious, on dissection, in all parts. The geographical distribution of this species is very extensive. I have received it from many distant quarters, both of the Northern and Southern Hemispheres.

139. **tenuissima** (*The slender Laurencia*); frond filiform, terete, irregularly divided; branches long and virgate, clothed with very slender, setaceous ramuli, which taper to the base and apex, *Grev. Alg. Brit. p.* 113. (ATLAS, Pl. XXXII. Fig. 143.)

Alsidium tenuissimum, *Ktz.* Chondria tenuissima, *Ag.* Gigartina tenuissima, *Lamour.* Fucus tenuissimus, *Good. and Woodw.*

Hab. South of England and Ireland. On rocks and stones between tide-marks; generally in shallow pools, about half-tide level. Annual. Summer. Very rare.

This is by much the most slender and delicate, as it is also the rarest, of the British species of *Laurencia*. Wherever it grows it is generally found in tolerable abundance, forming dense tufts, many of which will often be found in the same pool. The favourite locality is in very shallow tide-pools, fully exposed to the sun, and frequently situated but a short distance below high-water mark: thus clearly showing a partiality for warmth which marks the straggler from warmer latitudes. In such situations it frequently becomes much discoloured, the purple hue, which is natural to it, being exchanged for a greenish-yellow, at the same time that the cellular substance is much softened. I have received fine specimens from the shores of Tasmania, where it appears to be not uncommon.

XLIV. CHRYSYMENIA.

140. **clavellosa** (*The clubbed Chrysymenia*); frond gelatino-membranaceous, very much branched in a repeatedly pinnate manner, branches of various lengths, mostly distichous; ramuli distichous or quadrifarious, attenuated at the base; capsules conical, *J. Ag. Medit. p.* 107. (ATLAS, Pl. XXX. Fig. 136.)

Chondrothamnion clavellosum, *Ktz.* C. confertum, *De Not.* Chylocladia clavellosa, *Hook.* Gastridium clavellosum, *Lyngb.* G. purpurascens, *Lyngb.* Chondria clavellosa, *Ag.* Gigartina clavellosa, *Lamour.* Fucus clavellosus, *Turn.*

Hab. Atlantic shores of Britain. On rocks, stones, and parasitical on the smaller Algæ near low-water mark; also on the stems of *Laminariæ*, at a greater depth. Annual. Spring and summer.

Chrysymenia clavellosa was first described by Mr. Turner, in the sixth volume of the 'Linnæan Transactions,' where a figure is given, but was known, as this author in-

forms us, to the excellent Lightfoot, who proposed to describe it under the specific name bestowed upon it by Mr. Turner. It also appears to have been in some respects known to Hudson, in whose herbarium specimens are preserved. But previously to the publication of Mr. Turner's memoir, it was very commonly regarded as a state of *Chylocladia kaliformis*, a plant of a different structure and different ramification.

141. **rosea** (*The rosy Chrysymenia*); fronds distichous, pinnate, or bipinnate, the main stem and the pinnæ and pinnules elliptic-oblong, compressed; pinnæ opposite, *Harv. Phy. Brit. pl.* 301. (ATLAS, Pl. XXXI. Fig. 141, 142.)

Chrysymenia Orcadensis, *Harv.*

Hab. Orkney and Yorkshire. On rocks and Algæ in deep water. Annual?

Distinguished from the preceding species by its more elliptical and obtuse ramuli, which are greatly more constricted at the insertion. Another character consists in the tetraspores being collected into several distinct sori, not dispersed through the branchlets, or forming one general sorus.

XLV. CHYLOCLADIA.

142. **ovalis** (*The oval-leaved Chylocladia*); frond cylindrical, solid, irregularly dichotomous, naked below, above beset with simple, elliptical, rarely elongated and jointed, tubular ramuli; capsules spherical, with a wide transparent border, *Hook. Br. Fl. v.* 2. *p.* 297. (ATLAS, Pl. XXXII. Fig. 145.)

Gastridium ovale, *Grev.* Gastroclonium ovale, *Ktz.* Lomentaria ovalis, *Endl.* Chondria ovalis, *Ag.* Gigartina vermicularis, *Lamour.* Fucus ovalis, *Huds.* F. vermicularis, *Gm.* F. sedoides, *Good. and Woodw.*

Hab. Atlantic coasts of Britain. On rocks and stones within tide-marks. Annual. Spring and summer.

There is some difference in habit between this plant and the other members of the genus *Chylocladia*, but so close an affinity in the more important points of its structure, that it appears very undesirable to separate it from them, as has been proposed by Prof. Kützing. Except in having a solid, cellular stem and branches, the hollow and jointed portions being confined to the ramuli, there is nothing to separate it from *C. kaliformis*, the type of the genus. It is in greatest perfection in the months of April and May, at which season, on the west coast of Ireland, it forms a

conspicuous feature in the marine Flora, its densely tufted succulent fronds being then of a dark-red colour, and produced in the greatest abundance. Two months later, its aspect is completely changed; great multitudes of the fronds have perished, and those that remain are faded in colour, with attenuated and more compound ramuli. By the end of August the plant has almost entirely disappeared.

143. **kaliformis** (*The whorled Chylocladia*); frond subgelatinous, tubular, pyramidal; main stem simple, distended, distantly constricted; branches opposite or whorled, repeatedly compound; ramuli moniliform; capsules spherical, with a pellucid border, *Hook. Br. Fl. v.* 2. *p.* 397. (Atlas, Pl. XXXII. Fig. 146, and Pl. XXXIV. Fig. 151.)

Lomentaria kaliformis, *Gaill.* Gastridium kaliforme, *Lyngb.* Chondria kaliformis, *Ag.* Gigartina kaliformis, *Lamour.* Fucus kaliformis, *Good. and Woodw.* F. verticillatus, *Lightf.* Lomentaria patens, *Ktz.* Lomentaria squarrosa, *Ktz.*

Hab. On rocks and stones in the sea, between tide-marks, and in from four to fifteen fathoms water. Annual. Spring and summer.

A well-known plant, common to most of the shores of Europe, and found growing at various depths from about half-tide level to some fathoms below low-water mark. Like most species which have a wide range of climate, and which grow at various depths, sometimes on rock, sometimes on sand, and sometimes on the stems of other Algæ, it is subject to very great variations both in size and in the minor details of its branching.

144. **reflexa** (*The reflexed Chylocladia*); frond membranaceous, purple; lower branches cylindrical, slender, arched, attaching themselves by short ramuli tipped with discs; secondary branches simple, mostly secund, moniliform, spindle-shaped; ramuli few, scattered, patent or recurved, *Lenorm. Desm. Pl. Crypt.* No. 865. (Atlas, Pl. XXXI. Fig. 138.)

Lomentaria reflexa, *Chauv.* L. pygmæa, *Duby.*

Hab. North coast of Devon. On rocks in the sea near low-water mark. Annual. Summer. Very rare.

As a species, this is, perhaps, more nearly allied to *C. kaliformis* than to *C. parvula*, although at first sight it looks more like the latter. Its slender main branches, and the remarkable disc-like processes by which they attach themselves at intervals, taken with the small size, irregular branching, and less gelatinous nature, offer its

best distinguishing marks. The different form of the capsules affords alone a sufficient character to separate it from *C. parvula*.

145. **parvula** (*The small Chylocladia*); frond subgelatinous, slender, bushy, irregularly branched; ramuli scattered; branches constricted at intervals of (nearly) equal length and breadth; ceramidia conical, with a prominent orifice, *Hook. Br. Fl. v.* 2. *p.* 298. (ATLAS, Pl. XXXIV. Fig. 153.)

Gastridium parvulum, *Grev.* Lomentaria parvula, *Zanard.* Chondria parvula, *Ag.* Fucus kaliformis, var., *Turn.*

Hab. Parasitical on the smaller Algæ, in tide-pools, near low-water mark.

This plant, in many of its characters, resembles the smaller specimens of *C. kaliformis*, of which it was formerly considered to be merely a dwarf variety. But it may generally be known from all states of that species by its peculiarly bushy, dense habit, and the alternate disposition of its branches and ramuli; and when found in fructification, the two are clearly distinguished by the different form of the capsular fruit. The ceramidia of *C. kaliformis* are hemispherical; those of *C. parvula* are of much larger size, less abundant, and distinctly conical, with a much less evident hyaline border. The articulations of the branches are shorter and more equal than in *C. kaliformis*, and those of the main stems never so much distended, nor of so great a proportionate length.

146. **articulata** (*The jointed Chylocladia*); frond tubular, gelatinoso-membranaceous, strongly constricted throughout, as if jointed, much branched, between pinnate and dichotomous, fastigiate, the upper branches often crowded; capsules obtusely conical, *Grev. in Hook. Br. Fl. v.* 2. *p.* 298. (ATLAS, Pl. XXXIII. Fig. 147.)

Lomentaria articulata, *Lyngb.* Chondria articulata, *Ag.* Gigartina articulata, *Lamour.* Fucus sericeus, var., *Esper.* F. articulatus, *Lightf.* Ulva articulata, *Huds.*

Hab. Between tide-marks, attached to rocks and Algæ. Annual. Summer. Common.

Stunted individuals of *Chylocladia articulata* closely resemble *Catenella Opuntia*, and may sometimes be mistaken for that plant, although the colour is never so lurid as it always is in the *Catenella*. An appeal to the microscope may sometimes be necessary to the young student, and then there can be no difficulty, the whole structure is so different.

ORDER 9. *CORALLINACEÆ.*

XLVI. CORALLINA.

147. **officinalis** (*The medicinal Coralline*); decompound-pinnate; lower articulations cylindrical, twice as long as broad; upper slightly obconical, round-edged, their upper angles blunt; ultimate ramuli cylindrical, obtuse, *Linn. Syst. ed.* 10. *p.* 805. (ATLAS, Pl. XXXIII. Fig. 148.)

Corallina anglica, *Ger.*

Hab. On rocks between tide-marks, extending throughout the whole of the littoral zone, generally growing in rock-pools. Perennial. Winter and spring. Abundant.

On our own shores this plant puts on so many sportive appearances, that it would be easy to form from its varieties numerous species, as distinct as some that have been founded on single fragments coming from abroad. Colour has been assumed as a character in describing these plants. Nevertheless it is notorious that the colours of all corallines are remarkably fugacious, and that all quickly bleach, under the influence of the weather, to a milky whiteness. The form of the joints, almost the only tangible character, is subject to very wild variations, so that it is almost impossible, without a very full suite of specimens, to fix the limits of any of these plants. Our figure represents the stunted variety which occurs near high-water mark.

148. **elongata** (*The elongated Coralline*); lateral shoots of the branches slender and subulate, with long cylindrical articulations, *Johnst. Lith. p.* 221.

Hab. ?

I have seen no specimen of this, and have consequently been obliged to omit figuring it.

149. **squamata** (*The scaled Coralline*); decompound-pinnate; lower articulations cylindrical, scarcely longer than their breadth; upper obconical or obcordate, compressed, two-edged, their upper angles sharp and prominent; ultimate ramuli very slender, acute, *Parkinson*, 1296. (ATLAS, Pl. XXXIII. Fig. 149.)

Hab. South coast of England and West of Ireland. On submarine rocks, at the extremity of low-water mark. Perennial. Summer.

This species was noticed at an early period, and has been generally kept separate from *C. officinalis*, which it closely resembles, by most authors who have written on the sub-

ject. It differs from *C. officinalis* chiefly in the form of the upper joints of the stem and branches, which are broad and flat, with prominent and usually sharp angles.

XLVII. JANIA.

150. **rubens** (*The red Jania*); articulations of the principal branches and ramuli cylindrical, about four times as long as broad, *Lam. Cor. Flex. p.* 272. (Atlas, Pl. XXXIV. Fig. 154.)

Corallina rubens, *Ellis and Soland.*

Hab. Parasitical on the smaller Algæ, between tide-marks. Perennial. Summer.

The commonest species of the genus *Jania* and the most widely diffused. The genus *Jania*, if we confine it to the dichotomously branched species, may be allowed to stand as distinct from *Corallina*, at least in habit; but it must be admitted that the two genera approach very nearly, if they do not rather merge one into the other. Had we only to consider European forms, we might think differently. But the shores of warm countries, and especially of Australia, yield beautiful species, having the pinnated habit of *Corallina* with the *antennated* fruit (if so I may called it) of *Jania*. From *J. corniculata*, which it outwardly much resembles, *J. rubens* may at once be known by the long cylindrical lower articulations; and this much is generally sufficient to ascertain the species. But I observe on some specimens, especially those from the south of England, an occasional prolongation of the upper angles of the articulation, showing a tendency to approach *J. corniculata*. Several exotic species nearly resemble *J. rubens* in habit, differing chiefly in size and in the comparative length of the articulations.

151. **corniculata** (*The horned Jania*); articulations of the principal divisions obconical, compressed, their upper angles sharp and prominent; those of the uppermost ramuli cylindrical, filiform, *Lam. Cor. Flex. p.* 274. (Atlas, Pl. XXXIV. Fig. 155.)

Corallina corniculata, *Linn.*

Hab. Parasitical on the smaller Algæ, in rock-pools between tide-marks, and in 4–5 fathoms water. Perennial? Summer. Southern shores of England and Ireland.

Jania corniculata differs from the more common *J. rubens* chiefly, if not altogether, in the form of the lower articula-

tions; much as *Corallina squamata* differs from *C. officinalis*. The species has been generally kept up by all authors, since the time of Ellis, who first distinguished it. On the British shores it is most common on the southern coast, while *J. rubens* is found all round the island.

XLVIII. MELOBESIA.

152. **polymorpha** (*The many-shaped Melobesia*); frond attached to rocks, thick, stony, incrusting, or rising into short, clumsy branches, which are seldom much divided, and often merely rudimentary; ceramidia minute, depressed, extremely numerous, *Harv. Man. ed.* 2. *p.* 108. (ATLAS, Pl. XXXV. Fig. 157.)

Millepora polymorpha, *Linn.* Nullipora polymorpha, *Johnst.* Spongites polymorpha, *Ktz.* Corallium cretaceum lichenoides, *Ellis.*

Hab. On littoral rocks all round the coast, extending beyond low-water mark. Common.

To this form I refer most of the lumpy Nullipores, with thick stony fronds, and of various uncertain shapes, found incrusting tidal rocks, and occasionally thrown up or dredged from deeper water. Dr. Johnston's figures, at Plate XXIV. 1, 2, 3, of his 'History of British Sponges and Lithophytes,' represent a form which abounds in Dalkey Sound near Dublin, and on which the late Mr. M'Calla founded a species which he called *Nullipora compressa*. It perhaps ought to receive a specific name, but, if left unennobled, it seems to me rather to fall, as a variety, under *M. calcarea*, than under the present species.

153. **calcarea** (*The chalk Melobesia*); frond unattached, stony, shrub-like, much branched; branches slender, spreading in all directions, cylindrical, anastomosing below, free above, and tapering to a blunt point; ramuli either simple or forked, *Harv. Phy. Brit. pl.* 291. (ATLAS, Pl. XXXIV. Fig. 156.)

Nullipora calcarea, *Johnst.* N. fragilis, *M'Calla.* Spongites calcarea, *Ktz.* Millepora calcarea, *Ell. et. Sol.*

Hab. South of England, and west of Scotland and Ireland. On shingly or sandy shores, in 5–15 fathoms water. Perennial.

This is one of the commonest of the British deep-water species of *Melobesia*, being found in many parts of the coast, and generally in great abundance. It forms extensive banks, on which the fronds are heaped together without order, and appear to be kept from drifting merely by their weight. The specimens at the top of the banks are

alone living; those underneath, as may be at once known by their faded colour and offensive smell, are always found dead. In the West of Ireland, where this species abounds, it has been used as manure with success, being particularly suited to a peaty soil; but, as it requires to be dredged up—its weight and the depth at which it vegetates preventing its being drifted in quantity ashore,—the full use is not made of it by the peasantry which its value would seem to call for.

154. **fasciculata** (*The fasciculated Melobesia*); frond unattached, roundish or lobed, stony, much branched, fastigiate; branches solid, thick, crowded together, cylindrical or compressed; apices truncate, broad, somewhat concave, *Harv. Phy. Brit. pl.* 74. (Atlas, Pl. XXXV. Fig. 158.)

Millepora fasciculata, *Lam.* Nullipora fasciculata, *Blainv.* Lithothamnium crassum, *Phil.*

Hab. Lying on the sandy bottom of the sea, in 4–5 fathoms water.

This species would fall under the genus *Lithothamnium* of Philippi, if it be not the same that he has described by the name *L. crassum*. I think it must be by a slip of the pen that Decaisne unites these plants to *Amphiroa*, from which genus they differ in many ways, while they nearly or altogether coincide with his own group *Spongites* in *Melobesia*.

155. **agariciformis** (*The agaric-like Melobesia*); frond unattached, globular, hollow; foliations delicate, papyro-crustaceous, dense, erect, much lobed and sinuate, fastigiate; margin thin, entire, *Harv. Phy. Brit. pl.* 73. (Atlas, Pl. XXXV. Fig. 159.)

Millepora agariciformis, *Pall.* M. coriacea, *Linn.* M. decussata? *Ellis et Soland.* M. tortuosa, *Esper.* Nullipora agariciformis, *Blainv.* Pollicipora agariciformis, *Ehr.* Lithophyllum expansum, *Phil.* Melobesia expansa, *Endl.* Lithophyllum decussatum? *Phil.* Melobesia decussata? *Endl.* Mosco petroso, *Imperat.*

Hab. Lying on the sandy bottom of quiet bays, in 2–3 fathoms water. Rare.

I follow Decaisne in referring the *Nulliporæ* of Lamarck to the *Melobesiæ* of Lamouroux, the latter name having been generally adopted by such botanists as have described these productions, and the former by such zoologists as lay claim to them. Both names originated in 1816, and whichever have priority, it must be a narrow question of

months, which I am unable to decide. The present species would belong to *Spongites* of Kützing, and to *Lithophyllum* of Philippi, but does not appear in the list of *Melobesiæ* given by Decaisne, nor yet, except under the more modern trivial name *decussata*, in that of Endlicher. Nevertheless it is one of the earliest known species, as its numerous synonyms testify.

156. **lichenoides** (*The lichen-like Melobesia*); frond attached to rocks, free at the margins, foliaceous, lichen-like, variously lobed; foliations spreading, often imbricated; ceramidia large, conical, prominent, *Harv. Man. ed.* 2. *p.* 109. (Atlas, Pl. XXXV. Fig. 160.)

Millepora lichenoides, *Borl.*

Hab. Cornwall and west of Ireland. On rocks and in tide-pools near low-water mark.

This is by much the prettiest and most plant-like of the tidal Nullipores, strongly resembling in form and general habit one of the foliaceous lichens of the genus *Parmelia*, but differing in being of a stony substance;—thin however as paper, and very brittle. It is closely related to *M. agariciformis*, from which it differs more in general habit than by any precise character; that species growing in globose masses, which are unattached, and lie, subject to the drifting of the waves, on the sea-bottom.

157. **membranacea** (*The membranaceous Melobesia*); minute, dot-like, very thin, pale purple, circular, at length confluent, attached to other Algæ; ceramidia one or two, depressed, *Lamour. Cor. Flex. p.* 315. *pl.* 12. *f.* 2, 3. (Atlas, Pl. XXXVI. Fig. 163.)

Hab. Common on the leaves of *Zostera*, the fronds of *Chondrus crispus*, etc. All round the coast.

Frond from half a line to a line in diameter, very thin and filmy, circular at first, then, from several becoming confluent, more or less lobed or irregular. Ceramidia one or two, depressed.

158. **farinosa** (*The floury Melobesia*); minute, irregular in outline, rather thin, pallid, with two or three prominent ceramidia, *Lamour. Cor. Flex. p.* 315. *pl.* 12. (Atlas, Pl. XXXVI. Fig. 164.)

Hab. On various Algæ.

Rather larger and thicker than the preceding, with more prominent fruit. In other respects similar.

159. **verrucata** (*The warty Melobesia*); thin, expanded, irregularly lobed, pallid, dotted over with innumerable, small, pimply ceramidia, *Harv. Phy. Brit. pl.* 347, *c.* (ATLAS, Pl. XXXVI. Fig. 165.)

Hab. With the preceding.

Patches from a quarter to half an inch in length, oblong, variously lobed at the margin, uneven. *Ceramidia* very numerous, minute.

160. **pustulata** (*The pimpled Melobesia*); thick, dull purple or green, oblong or lobed, incrusting, smooth; ceramidia numerous, large, rather prominent, conical, *Lamour. Cor. Flex. pl.* 12. *f.* 2, *a*, B. (ATLAS, Pl. XXXVI. Fig. 166.)

Hab. On *Phyllophora rubens* and other Algæ. Common.

Patches often an inch or more in length, and half an inch broad, thickish, of irregular form, frequently lobed, closely adhering to flat surfaces or clasping cylindrical stems, the surface more or less uneven. Ceramidia several on each patch, clustered, of large size in proportion to those of other allied species, prominent, conical. Colour, when well grown, a dark reddish-purple, changing to green, and finally to white. I have thought it best to figure this and the three preceding reputed species on one plate, that the slight differences noticed between them may be seen.

XLIX. HILDENBRANDTIA.

161. **rubra** (*The red Hildenbrandtia*); frond cartilagineo-membranaceous (not stony), crustaceous, suborbicular, adhering by its lower surface, composed of very slender, closely packed, vertical filaments; conceptacles immersed in the frond, orbicular, depressed, pierced by a hole, and containing tetraspores and paraphyses at the base of the cavity, *Meneg. Mem. Riun. Nat. Padov.* 1841, *p.* 10. (ATLAS, Pl. XXXV. Fig. 161.)

Hildenbrandtia Nardi, *Zanard.* Rhododermis Drummondii, *Harv.*

Hab. On smooth stones and pebbles, between tide-marks, as well as in deep water. At all seasons?

The affinity of this obscure plant is rather doubtful, and I am by no means satisfied with the position which I have now assigned to it, next the Nullipores. It differs from those vegetables in wanting the lime which forms so remarkable a portion of their solid contents; but its cellular structure is not very unlike that of a Nullipore, and there

is a near resemblance in the fructification. The cells composing the frond in the *Nullipores* or *Melobesiæ* are longer and narrower than those of the *Hildenbrandtiæ*, but arranged in an order nearly similar. It forms a thin skin-like film, so closely applied to the surface of the body on which it grows, that it is impossible to remove a specimen without laceration. Its colours are sometimes much brighter than at others, especially in places where it is exposed to the dripping of fresh water.

L. HAPALIDIUM.

162. **phyllactidium** (*The fan-shaped Hapalidium*); "plant calcareous, consisting of a single plane of cellules, which are disposed in radiating dichotomous series forming an appressed flabelliform frond," *Ktz.* (Atlas, Pl. XXXV. Fig. 162.)

Hab. Common on Algæ.

The aspect of this little parasite is strikingly similar to that of a *Coleochæte*, but the calcareous nature of the cellular membrane seems to point to a different affinity. In the absence of information respecting its fructification, I can form but a guess as to the family in which it may most properly be arranged. In suggesting the *Corallinaceæ* I am chiefly guided by the calcareous tissue: the *habit*, indeed, is not unlike that of some of the minute *Melobesiæ*. Our figure represents the young plant, which afterwards becomes much more lobed and expanded.

Order 10. *DELESSERIACEÆ.*

LI. DELESSERIA.

163. **sanguinea** (*The blood-red Delesseria*); stem cylindrical, cartilaginous, branched, bearing oblong or obovate, transversely-veined leaves, entire at the margin; midrib percurrent, strong; lateral veins opposite; tubercles stalked, attached (in winter) to the membraneless midribs of old leaves; tetraspores densely aggregated in small sporophylla (produced in winter) on old midribs, *Lamour. Ess. p.* 124. (Atlas, Pl. XXXVII. Fig. 169.)

Wormskioldia sanguinea, *Spr.* Fucus sanguineus, *Linn.*

Hab. In deep rock-pools, between tide-marks, generally at the shady side of the pool, under projecting ledges of rock. Biennial. Fruiting in winter.

This fine plant, whether we regard the splendour of its

colour or the elegance of its form, is entitled to high rank in the oceanic Flora, and, notwithstanding its common occurrence on all our shores, is never seen without attracting admiration. In favourable localities it reaches to a very large size, and such specimens are among the most beautiful vegetable objects in nature.

164. **sinuosa** (*The sinuous Delesseria*); stem elongated and branched, beset with oblong or obovate, deeply-sinuated or pinnatifid, toothed, transversely-ribbed leaves, *Lamour. Ess. p.* 124. (ATLAS, Pl. XXXVII. Fig. 170.)

Wormskioldia sinuosa, *Spreng.* Fucus sinuosus, *Good. and Woodw.* F. crenatus, *Gm.* F. rubens, *Huds.* F. roseus, *Fl. Dan.* F. Palmetta, var., *Esper.*

Hab. Parasitical on the stems of *Laminaria digitata;* also attached to various substances in deep water. Perennial. Summer and autumn.

Next to *D. sanguinea* this, when well grown and of large size, is one of the handsomest of the genus. Our plate represents the frond in rather a young state, a specimen having been chosen for figuring which exhibits the changes that take place in form during the growth of the frond. At first the plant consists of a simple, penninerved leaf, sinuated at the margins. The sinuosities gradually deepen into lateral lobes; and these lobes, as is shown in the lower part of the figure, deepen into branches, or new fronds, at first sinuous, then lobed, and at length divided like the fronds from which they grow. Thus, eventually, a much branched and leafy frond results from the original leaf, by regular growth and subdivision of the margin. When any vigorous part is wounded, an irregular, proliferous growth likewise takes place, new leaflets springing from any part of the midrib. Sometimes the margin is much laciniated.

165. **alata** (*The winged Delesseria*); stem dichotomous, much branched, winged throughout with a narrow, membranous lamina which is pennate-nerved; tubercles rising from the midrib; tetraspores in sori occupying the apices of the frond, or in proliferous leaflets, *Lamour. Ess. p.* 124. (ATLAS, Pl. XXXVII. Fig. 171.)

Wormskioldia alata, *Spreng.* Hypoglossum alatum, *Ktz.* Fucus alatus, *Huds.*

Hab. Atlantic shores of Europe. On rocks and the larger Algæ, between tide-marks and in 4–10 fathoms water.

One of our commonest species; and though not without beauty, yet one of the least attractive of the genus to which it belongs. When well grown, with a broad wing to the stems, its beauty and grace will readily be admitted, but in average specimens the wing-like margin is much more narrow and is very liable to injury; the colour darker and more dingy; and the ramification less regularly dichotomous. Sometimes, from proliferous growth, the whole upper part of the frond is thick and bushy.

166. **angustissima** (*The very narrow Delesseria*); frond membranaceo-cartilaginous, compressed, very narrow, two-edged, much branched; branches alternate, distichous, of unequal length, much divided above, and furnished with numerous forked ramuli; tubercles imbedded either in the tips of the frond, or in small axillary ramuli; tetraspores forming sori (on distinct plants) either in the inflated apices, or in axillary, lanceolate ramuli, *Griff. Harv. Phyc. Brit. pl.* 83. (ATLAS, Pl. XXXIII. Fig. 150.)

Delesseria alata, var., *Ag.* Rhodymenia rostrata, *J. Ag.* Gigartina purpurascens, var., *Lyngb.* Gelidium? rostratum, *Griff.* Fucus alatus, var., *Turn.* F. alatus, junior, *Gm.*

Hab. Northern Atlantic Ocean. Parasitical on the stems of *Laminaria digitata*, often accompanying *Del. alata.* Perennial. Winter and spring.

It is nearly fifty years since Mr. Brodie first noticed the plant here figured, and sent specimens to Mr. Turner, by whom they were then considered to be a variety, which he called *angustissima*, of *Delesseria alata;* and in this judgment he was generally followed till the year 1840, when, in deference to the repeated protests of Mrs. Griffiths, I ventured, in the 'Manual,' to separate and describe Mr. Brodie's plant under the temporary name of *Gelidium? rostratum*, recommending it to the notice of observers, and adding that "my own opinion on this puzzling matter was not very decided." I possess specimens in which I can clearly trace the compressed edge of the frond passing into a very narrow membrane, and others which seem to be exactly intermediate between very narrow *alata*, and true *angustissima*. I am therefore now persuaded that Mr. Turner's judgment was strictly correct; Mrs. Griffiths however adheres to her already recorded opinion, and whichever view be eventually adopted, it must at least be acknowledged that *D. angustissima* is a very *remarkable form*, and as such deserving of a place in this work.

167. **Hypoglossum** (*The proliferous Delesseria*); frond linear-lanceolate, tapering at each end, repeatedly proliferous from the midrib, with leaflets of similar form; tubercles on the midribs of the smaller leaflets; granules forming linear spots at each side of the midrib, *Ag. Sp. Alg. v.* 1. *p.* 176. (Atlas, Pl. XXXVII. Fig. 172.)

Wormskioldia Hypoglossum, *Spreng.* Hypoglossum Woodwardii, *Ktz.* Fucus Hypoglossum, *Woodw.* F. hypoglossoides, *Stack.* Ulva lingulata, *De Cand.*

Hab. Atlantic shores of Britain. In the sea, on rocks and Algæ. Annual. Summer. Frequent.

This species varies indeed greatly in size, the frond being sometimes scarcely a line in width, sometimes nearly half an inch; but its admirable distinguishing character, that of being repeatedly proliferous from the midrib, is invariable. The only British plant with which a young botanist can confound it, is the somewhat rarer *D. ruscifolia*, from which its thinner substance, brighter colour, proportionally narrower leaves, and the lanceolate, not linear-oblong, form of the leaflets, distinguish it.

168. **ruscifolia** (*The obtuse-leaved Delesseria*); frond linear-oblong, obtuse, repeatedly proliferous from the midrib with leaflets of a similar form; leaflets traversed by oblique, anastomosing, pellucid striæ; tubercles on the midribs of the smaller leaflets; tetraspores forming linear spots at each side of the midrib, *Lamour. Ess. p.* 124. (Atlas, Pl. XL. Fig. 182.)

Wormskioldia ruscifolia, *Spreng.* Hypoglossum ruscifolium, *Ktz.* Fucus ruscifolius, *Turn.*

Hab. Generally growing on rocks, near low-water mark; sometimes parasitical on other Algæ. Annual. Spring, summer, and autumn.

The differences between this and the preceding species are as follows. In *D. Hypoglossum* the leaflets are lanceolate, tapering to each end, and generally, but not constantly, acute; in *D. ruscifolia* they are linear-oblong, much broader in proportion to their length, and always very blunt. But besides differences of form, which are not always constant, the cellules composing the membrane in the present species are much smaller, the substance denser and thicker, and the colour more intense than in *D. Hypoglossum*; while the confervoid striæ which traverse the leaves, and are readily seen in *D. ruscifolia*, are either very obscure or do not exist in *D. Hypoglossum*.

LII. NITOPHYLLUM.

169. **punctatum** (*The dotted Nitophyllum*); frond very thin and delicate, destitute of nervures, either regularly dichotomous, or cleft into two or three principal segments, whose margins are fringed with dichotomous lobes; axils rounded; spots of granules large, oblong, scattered over the whole surface of the frond, *Grev. Alg. Brit. p.* 79. *t.* 12. (ATLAS, Pl. XXXVIII. Figs. 173 and 174.)

Aglaiophyllum punctatum, *Mont.* Wormskioldia punctata, *Spreng.* Delesseria punctata, *Ag.* D. ulvoides, *Hook.* Fucus punctatus, *With.* F. ulvoides, *Turn.* Ulva punctata, *Stack.* Nitophyllum ocellatum, *Grev.* Aglaiophyllum ocellatum, *Mont.* Delesseria ocellata, *Lam.* Wormskioldia ocellata, *Spreng.* Halymenia ocellata, *Duby.* Fucus ocellatus, *Lam.* F. granateus, *Lam.* Nitophyllum Pollexfenii, *Grev.*

Hab. Attached to various Algæ, in pools at the extremity of low-water mark; but, more abundantly, and of much larger size, beyond the tidal influence, in 4–15 fathoms water Annual. Summer.

I have thought it necessary, for the proper illustration of *Nitophyllum punctatum* to give several figures, showing the principal forms which this variable plant assumes. Some of these look so distinct that many authors regard them as separate species, and it is not without having carefully examined the subject, and consulted a very extensive suite of specimens, that I have formed an opposite opinion.

170. **Hilliæ** (*Miss Hill's Nitophyllum*); frond thickish, but tender, veiny towards the base, of a roundish outline, very irregularly and more or less deeply cleft; the segments oblong, slightly waved, obtuse; spots of granules dot-like, very minute, densely scattered over the surface of the frond, *Grev. Alg. Brit. p.* 80. (ATLAS, Pl. XXXVIII. Fig. 175.)

Nitophyllum ulvoideum, *Hook.* Aglaiophyllum Hilliæ, *Endl.* Delesseria Hilliæ, *Grev.*

Hab. South of England. On the shady sides of deep tidal pools, near low-water mark. Rare. Annual. Summer and autumn.

I have thought it right to restore the specific name under which this fine species has been described by Dr. Greville, in preference to that of *ulvoideum*, which I adopted in the 'Manual,' in deference to the authority of Sir W. Hooker, who, in the 'British Flora,' regards *Nitophyllum Hilliæ* as identical with *Fucus ulvoides* of Turner.

171. **Bonnemaisoni** (*Bonnemaison's Nitophyllum*); frond shortly stalked, fan-shaped or palmate, variously cleft into numerous wedge-shaped segments, furnished near the base with irregular, vanishing nerves; spots of granules roundish, scattered over the surface of the frond, *Grev. Alg. Brit. p.* 81. (ATLAS, Pl. XL. Fig. 185.)

Delesseria Bonnemaisoni, *Ag.* Aglaiophyllum Bonnemaisoni, *Endl.*

Hab. Growing on the stems of *Laminaria digitata*, and on rocks and stones in 4–5 fathoms water. Annual. Summer.

The fan-like outline, scattered groups of tetraspores, and obscure basal veins distinguish the present species from other British *Nitophylla*. The nearest in affinity is certainly *N. versicolor*, from which the basal veins and the proportionally smaller size of the cellules composing the membrane, together with some small differences, more easily seen than described, distinguish it. From *N. Gmelini*, which it resembles in form, it is at once distinguished by the very different disposition of the tetraspores; from *N. Hilliæ*, by the thinner substance, smaller size, and less minute spots of tetraspores; and from *N. punctatum*, by the different outline of the frond. Where the *Nitophylla* luxuriate the shore is quite pink with them.

172. **Gmelini** (*Gmelin's Nitophyllum*); frond short-stalked, fan-shaped, with a roundish outline, variously cleft into broadly wedge-shaped segments, waved, curled, rather rigid, marked near the base (and sometimes over the surface) with vague, vanishing nerves; spots of tetraspores linear, confined to the margin, *Grev. Alg. Brit. p.* 82. (ATLAS, Pl. XXXVIII. Fig. 176.)

Aglaiophyllum Gmelini, *Mont.* Delesseria Gmelini, *Lamour.*

Hab. South of England; particularly large and abundant near Plymouth. On rocks and the larger Algæ, near low-water mark, and at greater depth. Annual. Summer.

From all the British species of *Nitophyllum*, except *N. laceratum*, this handsome plant may be at once distinguished, when in tetrasporic fruit, by the marginal position of the sori; from *N. laceratum* it can only be known by difference in form, in substance, and, in some measure, by its brighter colour. When the plants are freshly gathered, indeed, they are most easily separated, *N. Gmelini* being known by a peculiarly crisp, rigid feel, and *N. laceratum* by softness, and at the same time toughness. The colour of the latter is more purple, and

often reflects prismatic colours; and the nerves are much more clearly defined than in *N. Gmelini*.

173. **laceratum** (*The torn Nitophyllum*); frond sessile or shortly stipitate, much branched dichotomously, traversed by numerous branching and anastomosing nerves; segments linear, variously cleft and lobed, waved at the margin, obtuse; spots of tetraspores oblong, either marginal or borne on distinct leafy processes of the margin, *Grev. Alg. Brit. p.* 83. (Atlas, Pl. XXXIX. Fig. 177.)

Cryptopleura lacerata, *Ktz.* Aglaiophyllum laceratum, *Mont.* Delesseria lacerata, *Ag.* Wormskioldia lacera, *Spreng.* Chondrus laceratus, *Lyngb.* Fucus laceratus, *Gmel.* F. crispatus, *Huds.* F. endiviæfolius, *Lightf.*

Hab. On rocks and on the stems of *Laminaria digitata*, near low-water mark and at a greater depth. Annual. Summer.

This is the most generally dispersed species of *Nitophyllum*, and the one most usually met with within tide-marks. It frequently is found fringing the steep and shaded sides of deep rocky pools, when protected from the sun by overhanging *Fuci;* but its favourite place of growth seems to be on the stems of the larger oar-weeds. The frond varies much in breadth in different specimens, which however by no means represents the extreme forms. Some specimens are so broad and so little divided that they closely approach *N. Gmelini* in aspect, especially when dried; but the substance and colour of the two plants are essentially different, and when seen growing it is impossible to mistake one for the other. A very singular variety of *N. laceratum* is frequently seen between tide-marks, attaching itself by hooked lobes to neighbouring small Algæ, and sometimes so intricately interwoven with their stems that it cannot be extricated without tearing. In this the frond is very narrow, of a brighter colour than usual, and almost every lobe converted into a strong recurved hook.

174. **versicolor** (*The changeable Nitophyllum*); stem cartilaginous, elongated, simple or branched, suddenly expanding into a broadly fan-shaped, variously cleft frond, of a thickish-membranaceous, highly reticulate substance and rose-red colour, becoming golden-orange in fresh water; the segments rounded; the apices generally thickened, and ciliiferous; fructification unknown, *Harv. Manual, p.* 59. (Atlas, Pl. XL. Fig. 181.)

Hab. Very rare. Thrown up, probably from deep water. Annual. June to August.

To Mrs. Griffiths this species has been familiar for thirty years under the colloquial name "*Orange Dwarf*," which at once expresses its usually small size, as compared with others of the genus, and the rapid change of colour which it undergoes on touching fresh water. The last peculiarity is so striking that a passing shower of rain has often betrayed it to Mrs. Griffiths, when before the shower it had passed unnoticed among other red plants. Dr. Greville, in his 'Cryptogamic Flora,' considers it identical with *N. Bonnemaisoni*, an opinion which he subsequently abandoned; and in his 'Algæ Britannicæ' he refers it to *N. Gmelini*. I consider it to be distinct from both these species, at the same time admitting that it borders very closely on both, and that in the absence of a knowledge of its fructification it is difficult to fix on a very tangible distinguishing character.

LIII. PLOCAMIUM.

175. **coccineum** (*The scarlet Plocamium*); frond narrow, cartilaginous, plano-compressed; branches irregularly alternate, patent; ramuli subulate, secund, three or four consecutively, pectinate on their inner edges; tubercles lateral, sessile; stichidia scattered, lanceolate, simple or branched, *Lyngb. Hyd. Dan. p.* 39. *t.* 9. (Atlas, Pl. XXXIX. Fig. 178.)

Plocamium vulgare, *Lamour.* P. Lyngbyanum, *Ktz.* P. Binderianum, *Ktz.* Delesseria coccinea, *Ag.* D. Plocamium, *Ag.* Ceramium Plocamium, *Roth.* Fucus coccineus, *Huds.* F. Plocamium, *Gm.* Plocamium fenestratum, *Ktz.*

Hab. On submarine rocks and larger Algæ, generally beyond tide-level. Perennial. Summer and autumn. Common.

A well-known, abundant, and beautiful species, and an especial favourite with amateur weed-collectors, and manufacturers of seaweed pictures. With the exception of this *pelagic* species, the genus *Plocamium*, in which I include the *Thamnophora* of Agardh, and the *Thamnocarpus* of Kützing (not of Harv. in Hook. Ic. Plant.), is confined to the Southern Ocean, where many very distinct species are found, some of which are of large size, having brilliant crimson or rose-red fronds from a quarter to half an inch in breadth, and elegantly pectinato-pinnate. To all, the alternate, or secund, acute ramuli are common; the only variation being, that in some they are deltoid, in

others subulate, and in some secund *in pairs*, in others (as in our *P. coccineum*) secund *in fours*.

Order 11. *RHODYMENIACEÆ.*

LIV. STENOGRAMME.

176. **interrupta** (*The interrupted Stenogramme*); frond stipitate, membranaceous, flabelliform, more or less deeply laciniate; laciniæ repeatedly dichotomous, their apices obtuse; conceptacles forming a nerve-like line through the centre of each lacinia, and (usually) abruptly terminating opposite the furcation, *Mont. in Duchart. Rev. Bot.* 1846. *p.* 483. (Atlas, Pl. XXXVI. Fig. 167.)

Stenogramme Europæa, *Harv.* Delesseria interrupta, *Ag.*

Hab. Plymouth and Cork Harbours. Among rejectamenta, and dredged; attached to stones in 5–10 fathoms. Annual? November. Very rare.

This very interesting plant, by far the most important addition lately made to the British Marine Flora, was discovered on the 21st October, 1846, by Dr. John Cocks of Plymouth, among rejectamenta on the shore at Bovisand, near Plymouth. A few days subsequently it was met with in a neighbouring station by the Rev. W. S. Hore, who at the same time gathered the equally rare and curious *Carpomitra Cabreræ;* and to the untiring perseverance of both these gentlemen, who, day by day, during the inclement month of November—in all weathers—visited the shore, and preserved every scrap of these plants which the waves threw up, we are indebted for all the British specimens which have yet been taken of the *Stenogramme*, and for all, except Miss Ball's original one, of the *Carpomitra*.

LV. RHODYMENIA.

177. **bifida** (*The cloven Rhodymenia*); frond thin and transparent, rose-red, dichotomously divided from the base; segments linear, or cuneate; apices obtuse; tubercles mostly marginal, sessile; tetraspores transversely zoned, *Grev. Alg. Brit. p.* 85. (Atlas, Pl. XL. Fig. 183.)

Delesseria bifida, *Lamour.* Sphærococcus bifidus, *Ag.* Fucus bifidus, *Goodw. et Woodw.* F. bifidus, var., *Turn.*

Hab. Atlantic shores of Britain. On rocks in the sea, beyond the influence of the tide, and on Algæ. Annual. Summer. Frequent.

Some examples of this species are of a delicate rosy colour, transparent and membranaceous; while others are

more or less incrassated, and, especially when dry, of a brownish-red. It differs from others of the genus, not merely in being more membranaceous, but in its fructification, the tetraspores being divided by transverse zones, like those of *Plocamium*, of *Catenella*, and of some other Algæ; while in *Rhodymenia proper* they are of the more common tripartite kind.

178. **laciniata** (*The jagged Rhodymenia*); frond thickish, subcartilaginous, opaque, bright-red, more or less palmate or flabelliform, cleft into numerous, broad, wedge-shaped segments, which are again divided in a subdichotomous manner: the apices obtuse; the margin, when in fructification, curled and fringed with minute cilia, in which the tubercles are imbedded, *Grev. Alg. Brit. p.* 86. (ATLAS, Pl. XXXIX. Fig. 179.)

Delesseria laciniata, *Grev.* D. ciliaris, *Lamour.* Calophyllis laciniata, *Ktz.* Halymenia ciliaris, *Gaill.* Sphærococcus laciniatus, *Lyngb.* Fucus laciniatus, *Huds.* F. crispatus, *Stack.* F. miniatus, *Fl. Dan.* F. crispus, *Esp.*

Hab. Atlantic shores of Britain. On rocks and stones in the sea, and on *Laminariæ*; rarely within tide-mark. Biennial. January to July. Frequent.

This species is subject to very considerable variation in form, in size, and in the relative proportion of its different parts, and yet there is so much that is common to every variety, that it is rarely mistaken for anything else, although in the earlier days of marine botany its synonymy was very much confused. The structure of the frond in *Rhodymenia laciniata* is considerably different from that of the typical species, and at a future time it may become the type, as already proposed by Kützing, of a new group, to which, probably, several exotic species may belong. The large empty spaces, or lacunæ, with which the substance is permeated, which do not appear to be enlarged cells, but rather cavities, are not found in true *Rhodymeniæ*; and it is these, seen through the surface cellules, which give the appearance of areolation, noticed by Mr. Turner, when the plant is examined with a pocket lens, and which is lost if the frond be subjected to a higher magnifier.

179. **Palmetta** (*The little-palm Rhodymenia*); stem cylindrical, sub-simple, expanding into a fan-shaped, rose-red frond, which is more or less deeply cleft in a dichotomous manner; segments linear-wedge-shaped, with broad, rounded interstices, and a very entire, flat margin; apices, according to

the state of fructification, either erose or rounded; tubercles sessile, very convex, marginal or scattered; tetraspores cruciate or tripartite, forming deep-red sori in the expanded apices, *Grev. Alg. Brit. p.* 88. *t.* 12. (ATLAS, Pl. XXXIX. Fig. 180.)

Sphærococcus Palmetta, *Ag.* Delesseria Palmetta, *Lamour.* Halymenia Palmetta, *Gaill.* Fucus Palmetta, *Esper.* F. bifidus, *Huds.*

Hab. Atlantic shores of Britain. On rocks near the verge of low water, and at a greater depth; but more frequently on the stems of *Laminaria digitata.* Annual. Summer and autumn. Not uncommon.

This pretty species, though it varies as to the greater or less division of the frond, generally preserves a tolerably uniform, flabellate outline, which, taken in connection with its bright pinky colour, and rather rigid, crisp substance, sufficiently distinguishes it from any other British species. There are some closely allied forms in the Southern Ocean, as *R. corallina* and *R. flabelliformis*, which it is sometimes more difficult to separate. Among British plants the nearest in form is *Phyllophora membranifolia;* but this may always be known by the very different colour, independently of differences in the fructification. A marked difference exists between specimens which produce tetraspores, and those that bear tubercles. The former are invariably more expanded, with broad and rounded tips; the latter more drawn into a stem with shorter and denser segments, and truncate or abruptly cut tips.

180. **cristata** (*The crested Rhodymenia*); frond fan-shaped, membranaceous, subdichotomous, the segments dilated upwards, repeatedly subdivided; lesser divisions alternate, linear, laciniate at the ends and often fimbriate at the margin; tubercles spherical, marginal, sessile, *Grev. Alg. Brit. p.* 89. (ATLAS, Pl. XL. Fig. 184.)

Callophyllis cristata, *Ktz.* Sphærococcus cristatus, *Ag.* Fucus cristatus, *Herb. Linn.* F. gigartinus, *Fl. Dan.*

Hab. Growing on the roots and stems of *Laminariæ* in deep water. Very rare. Annual. July.

One of the rarest of the British Algæ, almost confined with us to the northern shores of Scotland, and the Orkney and Shetland Islands, and in no place found in abundance. In general, British specimens are small, rarely attaining the size of that represented in our plate. Most others which we possess are less than an inch in length; some

having deeply-cut fronds, and others comparatively little divided. All are however but pigmies to the specimens collected on the east coast of America, where this plant is as common as *Plocamium coccineum* is with us, and to be found as invariably ornamenting the *seaweed pictures* made by fair Bostonians, as the latter is in those manufactured at this side the Atlantic.

181. **ciliata** (*The ciliated Rhodymenia*); frond thick, subcartilaginous, dull purplish-red, rising from a short stalk, lanceolate or forked, irregularly pinnated with lanceolate or bifid segments, which are attenuated at base; the margin, and often the disc, more or less furnished with subulate cilia, in which the tubercles are imbedded; tetraspores collected in cloud-like patches dispersed over the disc; root branching, *Grev. Alg. Brit. p.* 90. (Atlas, Pl. XLI. Fig. 187.)

Calliblepharis ciliata, *Ktz.* Delesseria ciliata, *Lamour.* Halymenia ciliata, *Gaill.* Sphærococcus ciliatus, *Ag.* Fucus ciliatus, *Linn.*

Hab. On rocks, in pools near low-water mark, and at a greater depth. Annual. Fruiting in winter. Frequent.

Rhodymenia ciliata is of a thicker substance, and more rigid than any other British species of this genus, and is moreover distinguished from all of them, except *R. jubata*, by the fibrous character of the root. *R. jubata*, indeed, was long considered to be merely an extraordinary variety of *R. ciliata*, until characters were satisfactorily ascertained by Mrs. Griffiths, which seem permanently to separate it. These consist in a softer substance, a duller colour, and a difference in the fructification, and also in the season at which the plant is in perfection. It is only the smaller and narrower varieties of *R. ciliata* which can be confounded with *R. jubata*.

182. **jubata** (*The cirrhose Rhodymenia*); frond thickish, flaccid, subcartilaginous, dull-red, linear-lanceolate, much attenuated or cirrhose at the apex, vaguely pinnate with laciniæ of the same form; the margins, and often the disc, beset with subulate or filiform cilia, in which both tubercles and tetraspores are produced on distinct plants; root fibrous, branching, *Grev. Alg. Brit. p.* 91. (Atlas, Pl. XLI. Fig. 188.)

Calliblepharis jubata, *Ktz.* Sphærococcus jubatus, *Grev.* S. ciliatus, var., *Ag.* Fucus jubatus, *Good. and Wood.* F. ciliatus, var., *Turn.*

Hab. On the bottoms of rock-pools between tide-marks, chiefly

near low-water mark; also among the roots of *Laminaria digitata*. Annual. Fruiting in summer. Frequent.

This differs from the preceding species in its more flaccid substance and duller colour, and the different position of the tetraspores, these being confined to the cilia, while in *R. ciliata* they are immersed in the laciniæ of the frond. To this may be added, that *R. ciliata* is a winter plant, and *R. jubata* in perfection in summer. Few plants are more sportive in appearance: specimens are often found in which the cilia are very copiously developed, or where the whole frond is exceedingly slender, filiform, and entangled. Such examples may at first sight be mistaken for *Gigartina acicularis*.

183. **palmata** (*The Dulse or Dillisk Rhodymenia*); frond coriaceous or submembranaceous, purple, broadly wedge-shaped, irregularly cleft, palmate or dichotomous, sometimes repeatedly laciniate; the margin flat and even, sometimes winged with leaflets; granules distributed over the whole frond in cloud-like spots, *Grev. Alg. Brit. p.* 93. (Atlas, Pl. XLI. Figs. 189 and 190.)

Sphærococcus palmatus, *Ktz.* Halymenia palmata, *Ag.* Delesseria palmata, *Lamour.* Ulva palmata, *Dec.* Fucus palmatus, *Linn.* F. ovinus, *Gunn.* F. caprinus, *Fl. Dan.* F. bullatus, *Fl. Dan.* F. rubens, *Esper.* F. dulcis, *Gmel.* Ulva caprina, *Gunn.* Fucus Sarniensis, *Mert.* F. delicatulus, *Fl. Dan.* Sphærococcus Sarniensis, *Hook.* Rhodymenia sobolifera, *Grev.* Sphærococcus soboliferus, *Ktz.* Halymenia sobolifera, *Ag.* Ulva sobolifera, *Lyngb.* Fucus soboliferus, *Fl. Dan.*

Hab. On rocks within tide-marks, and on the stems of *Fuci*, *Laminariæ*, etc. Annual or biennial. Winter and spring.

At first sight it will scarcely be supposed that the specimens selected for the illustration of this species belong to the same plant, and yet these figures by no means exhibit the extreme of variation, for there are varieties more simple than the one and more finely divided than the other. The extensive list of synonyms given above shows a large number of book species formed out of the varieties of this plant. Most of these are admitted by modern authors to be, what I have considered them, merely forms of *R. palmata*. When such varieties are seen in a dried state in the herbarium, they appear so different that one may anticipate much difficulty in tracing the limits of the species. But on the shore the collector experiences no

such difficulty. If he has once seen and *tasted* a piece of Dulse, the characters, irrespective of form, are too well marked to allow of his puzzling himself with mere variations in outline. And what is very remarkable, the broad and slightly divided varieties may often be found growing side by side with the finely cut narrow ones. In Ireland and Scotland this plant is much used by the poor, as a relish with their food. It is commonly dried, in its unwashed state, and eaten raw, the flavour being brought out by long chewing. On many parts of the west coast of Ireland, it forms the only addition to potatoes, in the meals of the poorest class. The variety which grows on mussel-shells between tide-marks is preferred, being less tough than other forms, and the minute mussel-shells and other small shell-fish which adhere to its folds are nowise unpleasing to the consumers of this simple luxury, who rather seem to enjoy the additional *goût* imparted by the cranched mussels. In the Mediterranean this plant is used in a cooked form, entering into ragouts and made dishes; and it forms a chief ingredient in one of the soups recommended, under the name of "St. Patrick's Soup," by M. Soyer, to the Irish peasantry.

LVI. SPHÆROCOCCUS.

184. **coronopifolius** (*The buckshorn Sphærococcus*); frond very much branched, branches alternate or subdichotomous, fan-shaped, multifid, ending in acute laciniæ, fringed with cilia; tubercles immersed in the cilia, *Ag. Sp. Alg. v.* 1. *p.* 291. (Atlas, Pl. XLII. Fig. 191.)

Gelidium coronopifolium, *Lamour.* Rhynchococcus coronopifolius, *Ktz.* Fucus coronopifolius, *Good. et Woodw.* F. cartilagineus, *Huds.*

Hab. Frequent on the southern shores of England, and southern and western shores of Ireland. On rocky sea-shores, at extreme low-water mark, and at a greater depth; mostly cast on shore after a gale. Perennial. Summer and autumn.

Dr. Greville confined the amended genus *Sphærococcus* to the *S. coronopifolius* and to *S. crinitus*, Gm. The first of these, being the best known, is to be considered the type. Its structure is peculiar; under a pocket lens may be observed running through the branches the faint appearance of a midrib, connected with the margin by oblique lateral veins, both of which were first observed by

Mr. Sowerby. By making a transverse section, and applying a more powerful glass, this venation is seen to be caused by an internal rib, composed of denser and more elongated cells than the rest of the frond; and if the internal structure of the frond affords, in the Florideæ, the surest generic characters, the presence of such a rib ought to be essential to the genus. *S. coronopifolius* is said to be unknown on the eastern coast of England, and in Scotland it is extremely rare.

LVII. GRACILARIA.

185. **multipartita** (*The many-divided Gracilaria*); frond flat, tender, semi-transparent, brittle, dull purplish-red, deeply cleft in an irregularly dichotomous or palmate manner; the branches linear-wedge-shaped; apices acute; tubercles conical, very prominent, scattered over the segments, *Harv. Phy. Brit. Syn. p.* 25. (Atlas, Pl. XLIII. Fig. 196.)

Gracilaria polycarpa, *J. Ag.* Plocaria polycarpa, *Endl.* Rhodymenia polycarpa, *Grev.* Sphærococcus polycarpus, *Grev.*

Hab. South coasts of England. On rocks and stones in the sea, in deep water. Perennial? August and September. Very rare.

However diverse the *habit* of this species be from that of most other *Gracilariæ*, the structure both of the frond and fruit, as long since remarked by Mrs. Griffiths, accords much better with the structure than with that of the *Rhodymeniæ*. The thick walls of the tubercles, composed of filaments, and the large internal cells of the frond, are characters not to be overlooked.

186. **compressa** (*The compressed Gracilaria*); frond succulent, brittle, somewhat compressed, alternately or subdichotomously branched; branches long and mostly simple, tapering to a fine point; tubercles ovate or subglobose, sessile, scattered plentifully over the branches; tetraspores tripartite or cruciate, *Grev. Alg. Brit. p.* 125. (Atlas, Pl. XLII. Fig. 193.)

Plocaria compressa, *Endl.* Gigartina compressa, *Hook.* Sphærococcus compressus, *Ag.* S. lichenoides, *Grev.*

Hab. South of England. Cast on shore from deep water, attached to corallines, etc. Annual. Summer. Very rare.

G. compressa has something the aspect of *G. confervoides*, but may always be known by its more succulent frond and very different substance. It is as soft and brittle as *G. confervoides* is hard and tenacious. It also

bears some resemblance to the narrow variety of *G. multipartita*, but is more cylindrical, and of a different and much brighter colour. In some seasons it makes its appearance in considerable plenty, and may not again be seen for several years. I believe it has always been found among rejectamenta, as if cast up from deep water. The south coast of England is perhaps its northern limit. On the French and Spanish coasts, and especially in the Mediterranean, it is much more abundant.

187. **confervoides** (*The Conferva-like Gracilaria*); frond cartilaginous, cylindrical, filiform, irregularly (often very slightly) branched; branches long, subsimple, erect; ramuli few, tapering at each end; tubercles scattered, sessile, roundish, subacute, *Grev. Alg. Brit. p.* 123. (ATLAS, Pl. XLIII. Fig. 198.)

Hypnea confervoides, *J. Ag.* Sphærococcus confervoides, *Ag.* Gigartina confervoides, *Lamx.* Fucus confervoides, *Linn.* F. longissimus, *Gm.* F. verrucosus, *Huds.* F. albidus, *Huds.* F. flagellaris, *Esper.*

Hab. On rocks and stones in the sea, near low-water mark, and at a greater depth. Perennial. Summer and autumn. Not uncommon.

A variable plant, as its numerous synonyms testify, and yet, with a little practice, easily recognized among British Algæ. Several exotic species, however, nearly approach it, some of which ought, perhaps, to be united with it.

188. **erecta** (*The erect Gracilaria*); fronds numerous, from a common disk, short, erect, cylindrical, sparingly dichotomous; branches subsimple; tubercles globose, clustered; tetraspores contained in terminal, lanceolate, pod-like ramuli, *Grev. Alg. Brit. p.* 124. *t.* 14. (ATLAS, Pl. XXXVI. Fig. 168.)

Plocaria erecta, *Endl.* Gigartina erecta, *Hook.* Spærococcus (?) erectus, *Grev.*

Hab. South coast of England. On sand-covered rocks near low-water mark; also in 4–5 fathoms water. Perennial. Fruiting in winter. Very rare.

A curious and elegant little plant, scarcely known out of England, and one of the discoveries of Mrs. Griffiths, to whom it has long been familiar under the manuscript name *suffocatus*; a name designed to express a peculiarity of growth, its favourite habitat being the flat bottoms of shallow rock-pools, where it is generally half-buried in sand. Dr. Greville, who first described and figured it in his 'Cryptogamic Flora,' gave it the name *erectus*, from

another of its distinguishing characters, the peculiarly upright and rigid frond. When in perfect fructification it is easily recognized; the clustered tubercles and the lanceolate pod-like tips being both very striking characteristics.

LVIII. [HYPNEA.] CYSTOCLONIUM.

189. **purpurascens** (*The purple Cystoclonium*); frond dull purplish-red, excessively and irregularly branched, bushy, cartilaginous, soft; branches alternate, elongate, densely clothed with slender, many-times-divided branchlets, whose ultimate divisions are setaceous; tubercles spherical, immersed in the ramuli, *Harv. Phy. Brit.* pl. 116. (ATLAS, Pl. XLIII. Fig. 195.)

Gracilaria purpurascens, *Grev.* Plocaria purpurascens, *Endl.* Hypnea purpurascens, *Harv.* Gigartina purpurascens, *Lamour.* Sphærococcus purpurascens, *Ag.* Fucus purpurascens, *Huds.* F. tuberculatus, *Lightf.*

Hab. Very common on all the British shores. On rocks and stones, within tide-marks. Annual. Summer.

[In the 'Phycologia Britannica' I incorrectly referred the *Fucus purpurascens*, Huds., to the modern genus *Hypnea*, mistaking analogy for affinity, but I have long since abandoned this error, and adopted the genus *Cystoclonium* of Kützing, founded on the present species. I merely retain "*Hypnea*" between brackets in the present publication because it is the name now commonly known to English collectors. *Cystoclonium purpurascens* is among the commonest of our Algæ, very variable in appearance, and widely dispersed through the North Atlantic.—W.H.H.]

ORDER 12. *CRYPTONEMIACEÆ.*

LIX. GRATELOUPIA.

190. **filicina** (*The fern-like Grateloupia*); frond linear, narrow, tapering to either extremity, irregularly once or twice pinnated; pinnæ flexuous, patent, contracted at the base, and attenuated towards the apex, *Ag. Sp. Alg. v.* 1. *p.* 224. (ATLAS, Pl. XL. Fig. 186.)

Grateloupia porracea, *Ktz.* Delesseria filicina, *Lamour.* Gelidium neglectum, *Bory.* Fucus filicinus, *Wulf.*

Hab. South of England. On submarine rocks at half-tide level, frequently where small streamlets run into the sea. Very rare. Perennial. Winter.

The genus *Grateloupia* contains several species, all of

which are natives of the warmer parts of the temperate zone, about lat. 34° to 40°. *G. filicina* is the only one which has a very wide distribution, and it extends from the tropical ocean to the southern shores of Britain, where it becomes very much dwarfed in size, but where, nevertheless, it frequently produces fruit of both kinds. In the Mediterranean Sea, where it is common, the fronds are six or eight inches in expansion, and regularly and closely bipinnate, the pinnules an inch or more in length. The only British plant with which this is likely to be confounded, is *Gelidium corneum*, to some varieties of which it bears a very strong external resemblance. Its softer and more membranous substance will generally distinguish it to the feel; and the microscope will point out a difference of structure, when closely examined. If in a state of fruit, there can be no difficulty in discriminating between them.

LX. GELIDIUM.

191. **corneum** (*The horny Gelidium*); frond between cartilaginous and horny, flattish, distichous; branches linear, attenuated at each end, pinnate or bipinnate; pinnules opposite or alternate, patent, obtuse, *Lamour. Ess. p.* 41. (Atlas, Pl. XLIV. Fig. 199.)

Sphærococcus corneus, *Ag.* Fucus corneus, *Huds.* F. pinnatus, *Huds.* F. Hypnoides, *Desv.* F. pusillus, *Stack.* F. cæspitosus, *Stack.* F. crinalis, *Turn.*

Hab. On submarine rocks, from the verge of high water to the extreme of low water, and extending to a greater depth; often fringing the margin of tide-pools in places shaded by other Algæ. Common on all our shores.

A most variable plant, found in some of its varieties in almost all seas, and abundant everywhere.

192. **cartilagineum** (*The cartilaginous Gelidium*); frond several times pinnated, pinnæ and pinnulæ alternate, erecto-patent, with rounded axils, linear, obtuse; tubercles elliptical, mucronate, immersed in the ultimate pinnules, *Gaill. Résum. p.* 15. (Atlas, Pl. XLII. Fig. 192.)

Gelidium concatenatum, *Lamour.* G. versicolor, *Lamour.* Sphærococcus cartilagineus, *Ag.* Fucus cartilagineus, *Linn.* F. capensis, *Gm.* F. versicolor, *Gm.*

Hab. Thrown ashore, occasionally, on the south coasts of England. Perennial.

The specimen, from which the figure given with this

species has been prepared, forms part of a tuft of fronds picked up on the shore near Ryde, by Mr. Sheppard. I do not, however, consider the claims of this plant to be regarded as British at all increased by the discovery of these specimens, which were probably thrown overboard from some ship at Spithead, and wafted ashore. They have all the appearance of being Cape-grown: in size and colour and whole aspect, they are identical with the usual specimens brought by sailors from that coast. Were the plant of British growth, we should expect to find some characteristic mark, or, at least, that it would be thrown up from the sea in an unbleached state. From the geographical range of this plant, it is highly improbable that it should be a native of our shores. The nearest point to our shores of any of its well-ascertained habitats, is at the Canary Islands; the Mediterranean habitats being very uncertain.

LXI. GIGARTINA.

193. **pistillata** (*The pedicellate Gigartina*); frond compressed, stipitate, flabellately branched; branches repeatedly forked, with wide rounded axils, naked, or pinnated with short, horizontal ramuli; apices acute; tubercles solitary or in pairs, on the ramuli; tetraspores chained together, in immersed sori, forming distortions in the branches, *Lamour.* (Atlas, Pl. XLIII. Fig. 197.)

Sphærococcus gigartinus, *Ag.* Fucus pistillatus, *Gmel.* F. gigartinus, *Linn.* F. Œderi, *Esper.* Ceramium gigartinum, *Roth.*

Hab. Coast of Cornwall. On rocks, near low-water mark. Perennial. Winter. Very rare.

The characters of this species are so strongly marked, especially when in tubercular fruit, as is commonly the case, that it can scarcely be mistaken for anything else. In habit *G. mamillosa* comes nearest to it, but the channelled frond of that species affords a sufficient character. Barren specimens, or specimens with tetrasporic fruit, have rather the aspect of very narrow individuals of *Chondrus crispus*, but they seldom occur except in company with unmistakable forms.

194. **acicularis** (*The needle-branched Gigartina*); frond cylindrical, filiform, irregularly branched, between pinnated and dichotomous; branches divaricating, curved; ramuli few, very patent or recurved, subulate, often secund; tubercles

spherical, scattered on the branches, *Lamx. Ess. p.* 49. (Atlas, Pl. L. Fig. 225.)

Sphærococcus acicularis, *Ag.* Fucus acicularis, *Wulf.*

Hab. Jersey and south coast of England. On submarine rocks, near low-water mark. Annual. Winter. Rare.

This species is rare in England, but abundant on the shores of France and Spain and in the Mediterranean, and has been collected by Dr. Hooker at Tasmania.

195. **Teedii** (*Teed's Gigartina*); frond cartilagineo-membranaceous, flaccid, flat, linear, acuminate, repeatedly pinnate; the pinnæ opposite or alternate, horizontally patent, distichous, set with horizontal, spine-like ramuli; coccidia globose, on the ramuli, sessile, *Lamour. Ess. p.* 49. *t.* 4. *f.* 11. (Atlas, Pl. XLIV. Fig. 201.)

Chondracanthus Teedii, *Ktz.* Rhodymenia Teedii, *Grev.* Sphærococcus Teedii, *Ag.* Fucus Teedii, *Roth.*

Hab. Torbay. On rocks, at the extreme limit of low-water. Perennial. Very rare.

This is one of the rarest and most interesting of the British Seaweeds. It was first found in England by Mrs. Griffiths, in the year 1811, on a small rock in Elberry Cove, growing in scattered tufts on spots left bare at the extreme limit of low-water, of spring tides; and on this rock it continues to grow, and may generally be found in greater or less perfection every summer. In warm summers the plants are larger, more branching, and with broader membranes, and the tufts more numerous. Fructification has never been observed in this locality, and perhaps this is the cause why the plant appears never to have extended itself. On the opposite coast of Normandy, and southwards along the French coast, it is much more abundant, annually producing fruit; and in the Mediterranean *G. Teedii* is a very common plant.

196. **mamillosa** (*The mamillose Gigartina*); frond flabelliform, dichotomous, plane, channelled; segments wedge-shaped, cleft; tubercles roundish or ovate, pedicellate, scattered over the disc of the frond, *J. Ag. Alg. Medit. p.* 104. (Atlas, Pl. XLII. Fig. 194.)

Mastocarpus mamillosus, *Ktz.* Chondrus mamillosus, *Grev.* Sphærococcus mamillosus, *Ag.* Fucus mamillosus, *Good. and Woodw.* F. Polymorphus, *Lam.* F. echinatus, *Stack.* F. canaliculatus, var., *Huds.* F. ceranoides, var., *Lightf.* F. alveolatus, *Esper.*

Hab. On rocks near low-water mark. Perennial. Winter.

A common species on all parts of our shores, and dispersed throughout the Atlantic basin. Notwithstanding its well-marked characters, it has been confounded at one time with *Fucus canaliculatus*, an error hardly to be anticipated when the substance and colour are so exceedingly unlike; and afterwards with *Chondrus crispus*, to which there is a closer resemblance, though the channelled frond, rough with papillæ, clearly distinguish the present plant to the naked eye; while a difference in structure has latterly caused them to be placed in distinct genera.

LXII. CHONDRUS.

197. **crispus** (*The curled Chondrus*); frond stipitate, thickish, cartilaginous, flat or curled, segments wedge-shaped, very variable in breadth; apices truncate, subemarginate or cloven; axils obtuse; sori elliptical or oblong, concave on one side, *Lyngb. Hyd. Dan. p.* 15. *t.* 5. A, B. (ATLAS, Pl. XLIV. Fig. 202.)

Chondrus polymorphus, *Lamx.* C. incurvatus, *Ktz.* C. Celticus, *Ktz.* Sphærococcus crispus, *Ag.* Fucus crispus, *Linn.* F. ceranoides, *Gm.* F. membranifolius, *With.* F. polymorphus, *Lamx.* F. stellatus, *Stack.* F. lacerus, *Stack.* F. crispatus, *Fl. Dan.* F. filiformis, *Huds.* F. patens, *Good. and Woodw.*

Hab. On rocky sea-shores, extending from three-quarters tide level to low-water mark, and beyond it. Perennial. Spring and summer. Very abundant.

So variable is the present species in appearance, under different circumstances, that it is quite impossible to enumerate the many forms it puts on; and were we to attempt to figure even the principal varieties, the figures would fill many plates. Turner has ten varieties, and Lamouroux figures thirty-five. In estuaries where freshwater streams mix with the sea, and bring down much mud and sand, the *Chondrus* attains a great size, and is frequently very much lobed and fringed. This plant is the *Carrageen*, or Irish moss, of the shops, and is used in place of isinglass in the preparation of blanc-manges and jellies, the frond boiling down to a clear, tasteless gelatine.

198. **Norvegicus** (*The Norwegian Chondrus*); frond linear, dichotomous, flat; the axils patent; the apices rounded; favellidia minute, imbedded in the substance, or prominent,

cia) scattered over both surfaces of the
. 39. (ATLAS, Pl. XLIV. Fig. 203.)
Ag. Oncotylus Norvegicus, *Ktz.* Fu-
. F. Devoniensis, *Grev.*
water mark. Annual? September to

, if it be identical with the northern
ner, is singularly unfortunate in its
nuch more common in countries to
an in that country. Even in Eng-
ore abundant on the south coast,
requently on the shores of France
editerranean. Though with a gene-
spus, there is something in the tone
ated laciniæ, and the rounded axils
it easy to be recognized, indepen-
in fructification. The species most
. *crenulatus*, a native of Portugal,
be added to the British list.

PHYLLOPHORA.

yllophora); stem very short, expand-
or cuneate, simple or forked, rigidly
urely midribbed frond, which is re-
rom the surface; tubercles scattered,
ith sinuous folds; warts concealed un-
rev. Alg. Brit. p. 135. *t.* 15. (ATLAS,

Chondrus rubens, *Lyngb.* Delesse-
Fucus rubens, *Linn.* F. prolifer,
, *Fl. Dan.* F. crispus, *Huds.*
ky sides of deep tide-pools near low-
shadow of *Laminariæ*; also on rocks,
beyond tide-marks, from four to fifteen
Winter.
all the rocky shores of Northern
ne extremity of low-water mark
lving rocks, in places where it is
the sun or air. When free from
the case, its clear red colour and
a very ornamental plant. More
y *Melobesiæ* and *Flustræ*, so as to
ity. It is closely allied to the *P.*
Europe.

200. **membranifolia** (*The membrane-leaved Phyllophora*); stem cylindrical, filiform, branched; the branches expanding into broadly wedge-shaped, two-lobed or dichotomous segments; tubercles oval, on short stalks arising from the stem or leaflets; nemathecia forming broad patches in the centre of the leaflets, *J. Ag. Alg. Medit. p.* 93. (ATLAS, Pl. I. Fig. 4.)

Rhodymenia membranifolia, *Harv.* Chondrus membranifolius, *Grev.* Sphærococcus membranifolius, *Ag.* Fucus membranifolius, *Good. and Woodw.* F. fimbriatus, *Huds.*

Hab. On rocks and stones, between tide-marks. Perennial. Winter. Very common.

This plant bears a considerable resemblance in form to *Rhodymenia Palmetta*, and still more to the *R. flabellifera* of the Southern Ocean, but the colour and the fructification, so far as the latter is known, are very different: and I agree with my valued friend Mrs. Griffiths in regarding this as a species of *Phyllophora*, nearly related to *P. Brodiæi*.

201. **Brodiæi** (*Brodie's Phyllophora*); stem cylindrical, filiform, branched, the branches expanding into oblong, simple or forked, flat, membranaceous frondlets, which are proliferous from their extremity; tubercles sessile on the tips of the segments, *J. Ag. Alg. Medit. p.* 93. (ATLAS, Pl. XLV. Fig. 207.)

Coccotylus Brodiæi, *Ktz.* Chondrus Brodiæi, *Grev.* Sphærococcus Brodiæi, *Ag.* Delesseria Brodiæi, *Lamx.* Fucus Brodiæi, *Turn.*

Hab. Eastern coast of Scotland. Belfast Bay. On rocks in the sea. Rare. Perennial? Winter and spring.

Mr. Brodie, after whom this species is named, was particularly attached to the study of the Algæ, among which he made many interesting discoveries, the present among the number, and during a long and active life enjoyed the affectionate respect of a large circle of scientific friends. The specimen of *Phyllophora Brodiæi* represented in our plate, was collected by Mr. Brodie, and given to me among many others by Dr. Walker Arnott, the present owner of the Brodiæan Herbarium.

202. **palmettoides** (*The Palmetta-like Phyllophora*); root a widely-expanded disc; stem cylindrical, filiform, simple or branched, expanding into an oblong, narrow-obovate or cuneate, simple or once-forked, rose-coloured frond, which is sometimes proliferous; sorus of tetraspores solitary, transverse, elliptical, near the apex of the frond, immersed in its

substance, *J. Ag., Harv. Man. ed.* 2. *p.* 144. (ATLAS, Pl. L. Fig. 228.)

Hab. Coast of Devonshire. On rocks near low-water mark. Perennial. Winter and spring.

This species I formerly regarded as a variety of *Phyllophora Brodiæi*, according to the views of most British botanists. In the last edition of the 'Manual' I have recognized its specific existence under the name here given, a name adopted from Prof. J. Agardh, who, in a recent letter, points out particularly the characters which distinguish this little plant from the original *P. Brodiæi*. These characters are,—the position of the sorus of tetraspores; the brighter colour of the frond; and the much more widely expanded root. To these I would add a marked difference in its geographical distribution; for while *P. Brodiæi* is confined to our northern shores, *P. palmettoides* is a native, in this country, only of the south of England, and, on the Continent, is found in the Mediterranean.

LXIV. PEYSSONELIA.

203. **Dubyi** (*Duby's Peyssonelia*); frond membranaceous, orbicular or lobed, attached by the whole of its under surface, *Crouan, in An. Sc. Nat.* 1844. *p.* 368. *t.* 11. B. (ATLAS, Pl. L. Fig. 224.)

Hab. North of Ireland and west of Scotland. On old shells, stones, etc., in 10–15 fathoms water. Probably common on the British coasts.

The genus *Peyssonelia* was founded by Decaisne, on the *Fucus squamarius*, Gm., a species common in the Mediterranean, of larger size and more coriaceous texture than the present, and attached by a portion only of its lower surface. The *Zonaria rubra*, Grev. in Linn. Trans., is probably the young of that species. I am only acquainted with Kützing's *P. orbicularis* by the short description given in his work, by which it appears to be very closely allied to our *P. Dubyi*, but to differ in having its lower surface glabrous and closely adherent.

LXV. GYMNOGONGRUS.

204. **Griffithsiæ** (*Mrs. Griffiths's Gymnogongrus*); frond filiform, flexuous, cartilaginous, stipitate, many times dichotomous, the apices fastigiate, forked; warts of fructification oblong,

at length surrounding the stem, *Mart. Fl. Bras. v.* 1. *p.* 27, (ATLAS, Pl. XLIV. Fig. 200.)

Tylocarpus Griffithsiæ, *Kütz.* T. tentaculatus (?), *Kütz.* Chondrus Griffithsiæ, *J. Ag.* Gigartina Griffithsiæ, *Lamour.* Polyides Griffithsiæ, *Gaill.* Sphærococcus Griffithsiæ, *Ag.* Fucus Griffithsiæ, *Turn.*

Hab. On submarine rocks, near low-water mark. Perennial. Autumn and winter.

Though hitherto placed, in British works, in the genus *Gigartina*, the structure of this plant is much more similar to that of *Chondrus*. The structure, however, though similar, is not identical; and as the tetrasporic fructification, which alone is known to us, offers some peculiarities, I adopt the name invented by Von Martius for this and the nearly allied *G. plicata*. The fructification is a most beautiful microscopic object. The symmetry of the strings of tetraspores, each marked with a white cross, and each enclosed in its glossy pellicle, and brilliant as a ruby, is exquisitely beautiful. The plant is dispersed on most of the Atlantic shores, from a high northern latitude to the tropics. It generally occurs within tide-marks.

205. **plicatus** (*The entangled Gymnogongrus*); frond horny, cylindrical, filiform, very irregularly branched, entangled, wiry; branches sub-dichotomous; axils obtuse; ramuli often secund; fructification, oblong warts composed of obscurely-jointed filaments, *Ktz. Sp. Alg. p.* 789. (ATLAS, Pl. XLVI. Fig. 211.)

Gigartina plicata, *Lamour.* Sphærococcus plicatus, *Ag.* Tylocarpus plicatus, *Ktz.* Fucus plicatus, *Huds.* Scytosiphon hippuroides, *Lyngb.*

Hab. On rocks and stones within tide-marks, and at a greater depth. Perennial. Common.

There is a peculiar rigidity and wiriness in the frond of this plant, which at once distinguishes it from any other British Alga with which it can be confounded; and, when dry, the glossy surface is equally striking. It often occurs in large bundles, very much tangled together, and then looks like a mass of rigid dark-purple bristles. I have never seen fruit perfectly ripe on any specimens that I have examined. The wart-like receptacles of fruit are common enough, but they seem to come to perfection but seldom. This is very different from the habit of *G. Griffithsiæ*, in whose *gongri* tetraspores are always found, and are some of the most beautiful of marine microscopic objects.

G. plicatus, in its geographical distribution, is almost a cosmopolite.

LXVI. POLYIDES.

206. **rotundus** (*The round Polyides*); root an expanded disc; frond cylindrical, dichotomous, cartilaginous, solid, the axis consisting of densely packed, longitudinal, interlacing and anastomosing filaments; the periphery of coloured, horizontal, dichotomous filaments, whose lower half is composed of large, elliptical cells; their upper of much smaller, submoniliform cellules; fructification of two kinds, on distinct individuals; 1, oblong, irregularly formed, external warts, composed of dichotomous filaments, through which are scattered elliptical favellæ, having a broad pellucid limbus; 2, cruciate tetraspores, immersed at intervals among the filaments of the periphery, *Grev. Alg. Brit. p.* 70. *t.* 11. (ATLAS, Pl. XLVI. Fig. 212.)

Polyides lumbricalis, *Ag.* Spongiocarpus rotundus, *Grev.* Furcellaria rotunda, *Lyngb.* F. lumbricalis, *Ktz.* Chordaria rotunda, *Hook.* Gigartina rotunda, *Lamour.* Fucus rotundus, *Gm.* F. radiatus, *Good and Woodw.* F. caprinus, *Gunn.* F. fastigiatus, *Esper.*

Hab. Frequent on the shores of England and Ireland. On rocks in pools, within the tide-range. Perennial. Winter.

The genus *Polyides* is remarkable for its singular fructification, which strikingly differs both in appearance and structure from that of any other of the *Rhodospermeæ*. In appearance the conceptacular fruit most nearly resembles what are called *nemathecia*, but the distinct and isolated favellæ which it contains are very different from the contents of those imperfectly organized excrescences. Here, in what look like irregular warts, we have most perfectly formed and symmetrically arranged spores.

LXVII. FURCELLARIA.

207. **fastigiata** (*The pointed Furcellaria*); root branching; frond cylindrical, dichotomous, cartilaginous, solid; the axis consisting of densely packed, longitudinal, interlacing and anastomosing filaments; the periphery of coloured, horizontal, dichotomous filaments, issuing from those of the axis, whose lower half is composed of large, elliptical cells; their apices of much smaller cylindrical cellules; fructification "terminal, elongated, pod-like receptacles, containing a stratum of dark, oblong, pear-shaped spores in the circumference," *Lamour. Ess. p.* 26. (ATLAS, XLV. Fig. 208.)

Furcellaria lumbricalis, *Lamour.* Fucus fastigiatus, *Huds.* F. lumbricalis, *Gm.* F. furcellatus, *Linn.*

Hab. On submarine rocks, within tide-marks, generally growing in tidal pools. Perennial. Winter. Common.

There is such a strong external resemblance between this and the preceding species, that they are often mistaken one for the other, and without contrasting the fibrous root of the former with the large scutate base of the latter, it might, in some instances, be difficult to discriminate between them. There is, indeed, some difference in the structure of the frond, but not of a very striking character, and, though easily observed when slices of both are seen together under the microscope, most difficult of being defined in intelligible words. And yet, with this resemblance in general appearance, all modern authors, with the exception of Kützing, place them in different genera, and, until very lately, even in different families. Dr. Caspary has given, in the 'Annals of Natural History' (Second Series, vol. vi. p. 87), a minute account of the comparative structure of *Furcellaria* and *Polyides*, with micrometric measurements of the cells composing the various strata of their fronds.

LXVIII. DUMONTIA.

208. **filiformis** (*The thread-like Dumontia*); frond undivided, attenuated to each extremity, pinnated with long, simple, tapering branches, *Grev. Alg. Brit. p.* 165. *t.* 17. (Atlas, Pl. XLVI. Fig. 209.)

Dumontia incrassata, *Lam.* Halymenia filiformis, *Ag.* Chondria purpurascens, *Grev.* Gastridium filiforme, *Lyngb.* Conferva filiformis, *Fl. Dan.* Ulva filiformis, *Wahl.*

Hab. On rocks and stones in the sea, at half-tide level. Annual. Summer. *β.* in places exposed to tidal currents. Common.

A very common plant, and one which, though tolerably constant to a particular ramification, having long simple branches springing from a simple stem, is yet subject to many modifying causes, which affect its habit and general appearance very considerably. In one variety the frond is often an inch in diameter, and so much puckered and waved, that, except in colour, it strongly resembles *Enteromorpha intestinalis*. Yet this variation appears to arise solely from locality, being always found where a strong stream rolls down.

LXIX. HALYMENIA.

209. **ligulata** (*The strap-shaped Halymenia*); frond compressed or flat, irregularly dichotomous or palmate, the segments attenuated, often proliferous at the margin, *Ag. Sp. Alg. v.* 1. *p.* 210. (Atlas, Pl. XLVIII. Fig. 216.)

Halymenia elongata, *Ag.* Halarachnion ligulatum, *Ktz.* Ulva ligulata, *Woodw.* U. rubra, *Huds.* Mesogloia Hudsoni, *Ag.*

Hab. Frequent on the southern shores of England. On rocks and stones near low-water mark, rare; more usually dredged in 6–10 fathoms water. Annual. Summer.

Among British Algæ few exhibit wilder variations in form than this, and yet I have never known it to be mistaken by any person who has once had the advantage of seeing it in a living state. The pinky colour, and peculiarly soft substance, between gelatinous and membranaceous, and the innumerable dots of fructification, are found in every specimen, and sufficiently mark the species. In form and size there is extraordinary variety.

LXX. GINANNIA.

210. **furcellata** (*The forked Ginannia*); frond cylindrical, tender, uniformly dichotomous; the segments obtuse, *Mont. Pl. Cell. Can. p.* 162. (Atlas, Pl. L. Fig. 226.)

Halymenia furcellata, *Ag.* Myclomium furcellatum, *Ktz.* Ulva furcellata, *Turn.* U. interrupta, *Poir.* Dumontia triquetra, *Lamour.* Corallopsis dichotoma, *Suhr.*

Hab. Eastern and southern shores of England. On rocks, stones, oyster-shells, etc., from low-water mark to eight or ten fathoms water. Annual. Summer.

Though this plant is so widely distributed, and ought to be so well known, a very remarkable feature of its structure has been passed over by most authors who have described it. I allude to the *axis*, or internal *costa*, which exists in all specimens which have come under my notice, though it is very much more apparent in some than in others. Owing to the imperfect manner in which the frond recovers its form on immersion, after having been dried, this *costa* cannot always be shown by a transverse cutting of a dried specimen; but in the recent plant it may at once be detected, even where most obscure.

LXXI. KALLYMENIA.

211. **reniformis** (*The kidney-shaped Kallymenia*); stem short, cylindrical, suddenly expanding into a roundish, subsimple

or irregularly cleft, somewhat lobed frond; favellidia densely scattered over the surface, *J. Ag. Alg. Med. p.* 99. (ATLAS, Pl. XLVII. Fig. 213.)

Iridæa reniformis, *Bory.* Halymenia reniformis, *Ag.* Rhodymenia reniformis, *Hook.* Euhymenia reniformis, *Ktz.* Sarcophyllis lobata? *Ktz.* Fucus reniformis, *Turn.*

Hab. In deep shady pools, at extreme low-water mark, rare. Often washed on shore from deeper water. Perennial? Summer and autumn.

Kallymenia reniformis, first described in the 'Historia Fucorum,' was discovered by Miss Everett, early in the present century, on the shores of the Isle of Wight, and long regarded as an extremely rare species. Of late years many new habitats have been ascertained for it, and it is now, at least in Ireland, known to be far from uncommon. In Scotland it appears to be more rare, and yet it occurs as far north as Orkney.

212. **Dubyi** (*Duby's Kallymenia*); stem compressed, gradually expanding into an obovate, simple, dull-red frond, wedge-shaped at the base; favellidia very minute, densely scattered over the surface, *Harv. Phy. Brit. pl.* 123. (ATLAS, Pl. XLVII. Fig. 214.)

Halymenia Dubyi, *Chauv.* H. laminarioides, *Bory.* Nemostoma Dubyi, *J. Ag.* Iridæa Dubyi, *Lenorm.* Delesseria Ferrarii, *Bonnem. et Lamour.*

Hab. On rocks and stones, within tide-marks, in land-locked bays. Annual. Spring and early summer.

It will be seen that the frond of this species is considerably different in form from the typical specimens of *K. reniformis*, the outline much more approaching that of *Iridæa edulis*. Besides mere form, which is not absolutely to be depended on, this plant differs from *K. reniformis* in the duller colour, in its globules of spores being of a much smaller size, and somewhat in the structure of the frond. It arrives at maturity, too, at a much earlier season, being in greatest perfection in March and April, and becoming much faded and passing into decay in August; just at the period when the full-grown and strongly-coloured fronds of *Kal. reniformis* begin to come on shore.

LXXII. IRIDÆA.

213. **edulis** (*The edible Iridæa*); frond undivided, obovate, rounded at the apex and wedge-shaped at the base; with a

short stem, *Bory in Dict. Class. d'Hist. Nat. v.* 9. *p.* 15. (Atlas, Pl. XLVII. Fig. 215.)

Halymenia edulis, *Ag.* Delesseria edulis, *Lamour.* Ulva edulis, *DC.* Fucus edulis, *Stack.* F. dulcis, *Gm.* F. lactuca, *Esp.* F. carnosus, *Schmidel.* F. palmatus, var., *Lightf.*

Hab. On marine rocks, near low-water mark. Perennial. Fruiting in winter.

It is a singular, and almost an unaccountable fact, that this plant, than which none are more invariable in character, or more distinct in general appearance, should have been long confounded with *Rhodymenia palmata*, a plant of a very different form, different structure, and different substance. Withering was the first author who clearly defined the present; but it is to be regretted that he assigned the specific name *edulis* to it, for, though a favourite certainly with marine worms, it rarely constitutes a part of human food; the *R. palmata* being the true eatable *Fucus* or *Dulse* of the Scotch and Irish.

LXXIII. CATENELLA.

214. **Opuntia** (*The Indian-Fig Catenella*); fronds rising from a mass of creeping fibres, vaguely branched; pseudo-articulations lanceolate or elliptical, about four times as long as broad, *Grev. Alg. Brit. p.* 166. *t.* 17. (Atlas, Pl. XLIV. Fig. 204.)

Chordaria Opuntia, *Spreng.* Lomentaria Opuntia, *Gaill.* Halymenia? Opuntia, *Ag.* Chondria Opuntia, *Hook.* Gigartina Opuntia, *Lamour.* G. pilosa, *Lamour.* Rivularia Opuntia, *Gm.* Fucus Opuntia, *Good and Woodw.* F. repens, *ightf.* F. cæspitosus, *Stack.* Ulva articulata, var., *Huds.*

Hab. On submarine rocks, piles, etc., near high-water mark. Perennial. Rarely found in fruit.

This curious little plant, named from the resemblance of its branches to the jointed leaves of the *Cactus Opuntia*, can only be confounded with a dwarf state of *Chylocadia articulata*, which is about the same size. But, not to speak of difference of structure, the brighter colour, cylindrical joints, delicate substance, acute angles, and forked fronds of the latter, sufficiently distinguish it.

LXXIV. CRUORIA.

215. **pellita** (*The skin-like Cruoria*); frond gelatinoso-coriaceous, forming a skin on the surface of rocks, composed of vertical,

tufted, simple, jointed filaments, set in a gelatinose matrix; one of the joints of each filament larger than the rest; fructification, tetraspores lying at the base of the filaments, *Fries, Fl. Scan. p.* 316. (ATLAS, Pl. L. Fig. 227.)

Chætophora pellita, *Lyngb.* Chætoderma pellita, *Ktz.*

Hab. On smooth exposed rocks and stones, between tide-marks. Perennial. Fruiting in February.

Where a considerable surface of naked and smooth rock is exposed between tide-marks, it may commonly be observed to be covered here and there with skin-like patches of a dull red or olive-green, formed by the plant here figured, which adheres so closely to the surface of the rock that it can only be removed in flakes by scraping with a knife. It was first noticed on the shores of Norway and the Ferroe Islands, and has since been found in many places along the Atlantic coasts of Europe, and probably exists in many others where hitherto it has been overlooked.

LXXV. NACCARIA.

216. **Wiggii** (*Wigg's Naccaria*); frond cylindrical; branches irregular, subalternate, attenuated; ramuli spindle-shaped quadrifarious, *Endl. Gen. Pl. no.* 68. (ATLAS, Pl. XLVIII. Fig. 218.)

Chætospora Wiggii, *Ag.* Fucus Wiggii, *Turn.* Cladostephus Wiggii, *Spreng.*

Hab. On marine rocks, at and beyond the extreme limit of the tides. Annual. Summer. Very rare.

This charming plant, as rare as it is beautiful, was discovered by Mr. Lilly Wigg, on the Norfolk shore, about the year 1790, and first described by Mr. Dawson Turner in a paper read before the Linnæan Society in 1801. Since that period it has been detected on many different parts of the English and Irish coasts; but not as yet, that I am aware of, in Scotland.

LXXVI. GLOIOSIPHONIA.

217. **capillaris** (*The slender Gloiosiphonia*); frond cylindrical, tubular, gelatinous; the periphery composed of a thin stratum of longitudinal, interlaced fibres, clothed externally with short, horizontal, branched, moniliform filaments; fructification spherical masses of spores (favellidia), immersed in the moniliform filaments, to whose bases they are attached, *Carm. Alg. Appin. MS. Berk. Gl. of Br. Alg. t.* 17. *f.* 3. (ATLAS, Pl. XLVIII. Fig. 219.)

Mesogloia capillaris, *Ag.* Gigartina capillaris, *Lamour.* G. lubrica, *Lyngb.* Fucus capillaris, *Huds.*

Hab. On submarine rocks, growing in tide-pools, near low-water mark; frequently cast on shore from deeper water. Annual. Summer.

A highly beautiful plant, nearly related in affinity to the genus *Dudresnaia*, but, according to the views of the late Captain Carmichael, of Appin, forming the type of a separate genus, which differs from *Dudresnaia* chiefly in having a tubular axis. The structure, as seen by the microscope, is very beautiful, and such that it is impossible to do it justice in drawing, the extreme lubricity and transparency of the parts being lost in a lithograph. The whole plant is very tender, and invested with a gelatinous pellicle, and each filament of which it is composed stands separated from its neighbour, by a similar coating.

Gloiosiphonia capillaris is rather uncertain in its appearance, being found in some seasons in considerable plenty and not occurring again, sometimes, for several years.

LXXVII. NEMALEON.

218. **multifidum** (*The many-slit Nemaleon*); frond dichotomous, slightly branched, dull purple; the axils rounded, *J. Ag. in Linnæa, v.* 15. p. 453. (Atlas, Pl. XLVI. Fig. 210.)

Mesogloia multifida, *Ag.* M. Balani, *Carm.* Chordaria multifida, *Lyngb.* Chætophora multifida, *Hook.* Rivularia multifida, *Web. et Mohr.* Helminthora multifida, *Ktz.* Nemaleon lubricum, *Duby?*

Hab. Common along the western shores of Scotland and Ireland. On rocks, Balani, and shells (frequently on *Mytilus rugosus*), near low-water mark, in exposed situations.

This plant, which is found on most of the rocky shores of Europe, occurs in considerable plenty on our western shores, growing near low-water mark, either on the bare rocks or on shells attached to them; and generally in situations where it is exposed to the air for a few hours, and at the same time subject to be lashed by the waves. Except in the degree of ramification, it has no varieties.

219. **purpureum** (*The purple Nemaleon*); stem undivided, attenuated at base and apex, set with numerous, irregularly inserted, elongated, simple, tapering branches, which are either naked, or furnished with a second series of similar branches, *Chauv. M. p.* 57. (Atlas, Pl. XLVIII. Fig. 261.)

Mesogloia purpurea, *Harv.* Dumontia Calvadosii, *Lamour.*

Hab. In sandy places, among *Zostera*, near low-water mark. Annual. Summer.

The *structure* of this species differs considerably from that of the preceding, and probably may justify the future formation of a genus, when the fructification of both plants shall be more perfectly known. In our *N. purpureum*, the axis is composed of much more laxly set filaments; while those of the periphery are less branched, shorter, and composed of very large, pear-shaped cells. Seen under a lens of low power, the branches appear like tubes of glass, densely covered with brilliant purple studs. *N. purpureum* is a rare species on the British shores, though occasionally thrown up in considerable quantities.

LXXVIII. DUDRESNAIA.

220. **coccinea** (*The scarlet Dudresnaia*); frond rosy-red, tender and gelatinous, much and irregularly branched; branches alternate, flexuous, moniliform, attenuated upwards; ramuli more or less numerous, *Bonnem. in Journ. Phys. v.* 94, *p.* 180. (Atlas, Pl. XLIX. Fig. 220.)

Mesogloia coccinea, *Ag.* Rivularia verticillata, *E. Bot.*

Hab. On rocks, etc. near low-water mark; or, more generally, in 4–10 fathoms water. Annual. Summer. Very rare.

One of the rarest of the British Algæ, scarcely known except on the southern shores of England, and there only in a few stations, and nowhere in great abundance. Perhaps one cause of its comparative rarity is its place of growth. Being a deep-water species it is rarely found except when cast ashore after a gale, or when sought by dredging. In the former case the specimens are frequently very flaccid, and faded in colour. There is considerable difference in structure and also in appearance between young and old plants. In the former the axis is a simple, jointed filament, not very unlike that of a *Griffithsia*, whorled at short intervals with beaded fibres. But as the plant increases in age, the axis becomes more compound, until it consists of a bundle of closely packed filaments; and then the branches become thicker and more cylindrical. *Favellidia* are commonly produced in abundance. *Tetraspores* are much more rare.

221. **divaricata** (*The divaricate Dudresnaia*); frond filiform, pale-red, very much branched; branches opposite or alternate, horizontal, once or twice pinnated; ramuli numerous,

divaricate, irregular, obtuse, *J. Ag. Alg. Medit. p.* 85. (ATLAS, Pl. XLIX. Fig. 221.)

Mesogloia divaricata, *Ag.* M. Hudsoni, *Harv.* Ulva rubens, *Huds.*

Hab. On stones, and the smaller Algæ, near low-water mark, and at a greater depth. Annual. Summer and autumn.

It is still a question whether this plant really belongs to the genus *Dudresnaia*, and not rather to *Nemaleon*. If we judge it by outward habit it will be placed in the former; but there is certainly an approximation in structure to the latter, although the axis is less dense and somewhat differently constructed. The fructification is imperfectly known. I have sought in vain among a large number of specimens, from different localities, for tetraspores. All the specimens we have independently examined produce *favellidia*.

LXXIX. CROUANIA.

222. **attenuata** (*The attenuated Crouania*); frond gelatinous, filiform, consisting of a jointed single-tubed filament, whose joints are clothed with dense whorls of minute, multifid ramelli; fructification of two kinds, on distinct individuals; 1, "favellidia subsolitary near the apex of the ramuli, affixed to the base of the whorled ramelli, and covered by them, containing, within a hyaline membranaceous perispore, a subglobose mass of minute spores;" 2, obovate tetraspores, of large size, affixed to the bases of the ramelli, *J. Ag. Alg. Medit. p.* 83. (ATLAS, Pl. L. Fig. 229.)

Mesogloia attenuata, *Ag.* M. moniliformis, *Griff.* Griffithsia nodulosa, *Ag.* Callithamnion nodulosum, *Ktz.* Batrachospermum attenuatum, *Bonnem.*

Hab. Parasitical on the smaller Algæ. Annual. Summer.

This beautiful little plant was first noticed by Bonnemaison, on the northern shores of France, where it appears to be of as rare occurrence as it is in England. Subsequently, Agardh detected it in both the Adriatic and Mediterranean Seas, from various localities of whose shores I have received specimens, rather more luxuriant than our British plants, but not affording any essential distinctions. Mrs. Griffiths suggested it might prove the type of a new genus, allied on the one hand to *Dudresnaia*, on the other to *Batrachospermum*, and the younger Agardh has accordingly assigned to it the name it here bears. It must be confessed however that, except for the very decided gelatine, and some difference in the conceptacular fruit (as

described by J. Agardh), there is little to separate it from *Callithamnion*, to which genus it is united by Kützing.

Order 13. *CERAMIACEÆ.*

LXXX. PTILOTA.

223. **plumosa** (*The feathery Ptilota*); frond cartilaginous, decompound; secondary branches bi-tripinnate, elongate; pinnæ and pinnules exactly opposite, the latter subulate, cellular, traversed by a narrow, immersed, jointed filament; tetraspores on short pedicels, fringing the margin of the pinnules; flavellæ pedunculate, with an involucre of 6–8 subulate ramuli, *Ag. Sp. A. v.* 1. *p.* 385. (Atlas, Pl. XLIX. Fig. 223.)

Ceramium plumosum, *Roth.* Plocamium plumosum, *Lamour.* Fucus plumosus, *Linn.*

Hab. Parasitical on the stems of *Laminaria digitata.* Perennial. Summer and autumn.

Our figure and description apply solely to the var. *a* of Turner, which, though abundant on the shores of Scotland and the north and west of Ireland, is rare in England, and quite unknown on our southern shores. As far as my experience goes, it invariably grows on the stems of *Laminaria digitata*, which it often clothes with a rich feathery fringe. The var. β of Turner, which is the common plant of the south of England, chiefly grows on rocks; and preserves its characters so constantly that I cannot help regarding it, with Kützing, as a distinct species.

224. **sericea** (*The silken Ptilota*); frond flaccid, excessively branched; secondary branches bi-tripinnate; pinnæ and pinnules exactly opposite, the latter linear, composed of a single row of cells; tetraspores on short processes of the pinnules; favellæ pedunculate, binate, naked, or surrounded with a few irregular ramuli, *Ktz. Phyc. Gen. p.* 378. (Atlas, Pl. XLIX. Fig. 222.)

Ptilota plumosa, var., *Ag.* Fucus sericeus, *Gm.* F. Ptilotus, *Gunn.* F. pectinatus, *Gunn.* Plocamium elegans, *Bory, sec. Ktz.*

Hab. On the perpendicular faces of rocks, between tide-marks; rarely on the stems of *Fucus serratus.* Perennial. Summer and autumn. Very common.

This is the var. β of Turner's *Ptilota plumosa* just spoken of. It differs mainly in having the ramuli much more simple.

LXXXI. MICROCLADIA.

225. **glandulosa** (*The glandular Microcladia*); frond filiform, compressed, distichously branched, traversed by a wide, articulated tube, surrounded by numerous, large, coloured, angular, radiating cells; external coat formed of minute reticulated cellules; fructification of two kinds, on distinct individuals: 1, tetraspores immersed in the ramuli; 2, sessile, roundish receptacles (*favellæ*), having a pellucid limbus, containing numerous minute angular spores, and surrounded by several, short, simple, involucral ramuli, *Grev. Alg. Brit. p.* 99. *t.* 13. (ATLAS, Pl. LI. Fig. 230.)

Delesseria glandulosa, *Ag.* Fucus glandulosus, *Soland.*

Hab. Growing on rocks in the sea, or on Algæ, or Sponges, either near extreme low-water mark, or at a greater depth. Very rare. Annual.

As a genus, *Microcladia* is very closely indeed allied to *Ceramium*, with which it agrees in habit, and merely differs in some minor points of structure. Some specimens of *C. rubrum* nearly resemble it, but the absence of external joints in the *Microcladia* is a character sufficiently obvious to distinguish it from the *Ceramium*. *Microcladia glandulosa* is often found tangled with other Algæ, upon which it grows; and sometimes creeps over them in the manner of a *Cuscuta*, throwing out root-like fibres along the branches; these adhere so strongly that it is impossible to disengage them without laceration.

LXXXII. CERAMIUM.

226. **rubrum** (*The red Ceramium*); filaments robust, gradually attenuated upwards, irregularly dichotomous, with lateral, forked or multifid ramuli, the apices hooked inwards; articulations coated with coloured cellules, unarmed, the lowermost twice as long as broad, the upper shorter than their breadth; dissepiments constricted; tetraspores immersed in the articulations, whorled; favellæ globose, mostly borne on the lateral branchlets, subtended by three or four involucral ramuli, *Ag. Syn. p.* 60. (ATLAS, Pl. LIII. Fig. 242.)

Ceramium virgatum, *Roth.* C. elongatum, *Roth.* C. axillare, *DC.* C. nodulosum, *Ducluz.* C. secundatum, *Lyngb.* Conferva rubra, *Huds.* C. nodulosa, *Lightf.* C. tubulosa, *Huds.* C. flocculosa, *Ellis.*

Hab. Growing on rocks, stones, and the smaller Algæ, in rock-pools, from near the extreme of high-water to low-water

mark; also dredged in four or five fathoms. Annual. Summer and autumn.

This plant, one of the most universally diffused of the *Florideæ*, and one of the commonest on every shore where it grows, puts on so many deceptive appearances that the young botanist, and even the experienced observer, are again and again deceived by it. As it grows from near the limit of high-water to beyond the recess of the tide, it is exposed to a very variable amount of solar light and heat, a circumstance which at once accounts for the varieties in colour which the frond assumes.

227. **botryocarpum** (*The bunch-fruited Ceramium*); filaments crooked at the base, robust, gradually attenuated upwards, irregularly dichotomous, with numerous lateral, mostly simple ramuli, the apices straight; articulations coated with coloured cellules, unarmed, the lowermost twice as long as broad, the upper shorter than their breadth; dissepiments constricted; tetraspores immersed in the articulations, whorled; favellæ globose, of small size, heaped together in irregular clusters, borne on the lateral branchlets, destitute of involucral ramuli, *Griff. in Herb.—Harv. Phyc. Brit. pl.* 215. (Atlas, Pl. LIII. Fig. 243.)

Hab. On rocks and Algæ, between tide-marks. Annual. Summer.

C. botryocarpum is known from *C. rubrum* by its remarkable fruit, consisting of a great number of tetraspores heaped together like bunches of grapes; in this respect it agrees with *C. Deslongchampsii*. I have however occasionally found solitary, involucrate favellæ, exactly similar to those of *C. rubrum*, on the same plants, which produced clustered fruit on most of their branchlets. The colour is generally darker and more purple than in *C. rubrum*, and the tips of the branchlets are straight. These are the principal characters on which it is proposed to establish the species.

228. **decurrens** (*The decurrent Ceramium*); frond robust, gradually attenuated upwards, dichotomous, with few lateral branchlets, the apices hooked inwards; articulations partially coated with coloured cellules, which extend from the dissepiment at each end, but leave a colourless pellucid space in the centre of the articulation; lowermost articulations twice as long as broad; upper very short, *Harv. Man. ed.* 2. *p.* 162. (Atlas, Pl. LI. Fig. 231.)

Hormoceras decurrens, *Ktz.*

Hab. On the smaller Algæ, in tide-pools. Rare. Annual. August.

C. decurrens seems to be almost exactly intermediate between *C. rubrum* and *C. diaphanum*. It agrees with the former in size, but differs in having a translucent space, destitute of coloured cells, in the middle of each internode. From *C. diaphanum* it differs chiefly in having the lines of coloured cells which clothe the nodes continued over a considerable space of the articulation, and thus, as it were, *decurrent* along the stem. The exact disposition of these cells, and the structure of the stem, is well seen when a longitudinal slice is taken. The minute coloured cells will then be found immersed in the transparent walls of the frond.

229. **Deslongchampsii** (*Deslongchamps' Ceramium*); filaments subsetaceous, attenuated upwards, rigid, irregularly dichotomous, with or without lateral ramuli; the apices straight, spreading; articulations colourless, those of the main stems about thrice as long as broad, of the branches and ramuli much shorter; dissepiments opaque, scarcely swollen; tetraspores whorled round the joints, prominent; favellæ (?) heaped together, bursting irregularly from the sides of the branches, destitute of involucral ramuli, *Chauvin, Alg. Norm.* (Atlas, Pl. LII. Fig. 236.)

Ceramium Agardhianum, *Griff.* Gongroceras Deslongchampsii, *Ktz.*

Hab. On rocks and stones between tide-marks, and on the smaller Algæ. Annual. Spring and summer.

A more slender plant than *C. diaphanum*, of a darker colour and with shorter joints, and further distinguished from that species by the straight tips of the branches, more prominent tetraspores, and above all by the clustered favellæ, bursting in irregular masses from various parts of the stem and branches. A distorted variety frequently occurs among normal specimens, and this is very generally furnished with the anomalous fruit. Some specimens are excessively squarrose, with the stem and branches regularly bent at short distances, and every ramulus divaricating.

230. **diaphanum** (*The diaphanous Ceramium*); filaments setaceous, attenuated upwards, rather flaccid, irregularly dichotomous, the lower forkings distant, the upper close together; branches set with short, lateral, dichotomous ramuli; articulations colourless, those of the main stems three or four

times as long as broad, of the ramuli short; dissepiments swollen, opaque; apices hooked inwards; tetraspores whorled in the joints, depressed; favellæ in the ultimate forkings of the branches, or on lateral ramuli, involucrate, *Roth*, *Cat. Bot. v.* 3. *p.* 154. (ATLAS, Pl. LII. Fig. 237.)

Hormoceras diaphanum, *Ktz.* Conferva diaphana, *Lightf.* C. nodulosa, *Huds.* Boryna diaphana, *Grat.*

Hab. Parasitical on several of the smaller Algæ, in rock-basins, between tide-marks; sometimes growing on rocks. Annual. Summer.

This is the *typical* form of the old *Conferva diaphana* of British authors, the longest known of the extensive group of the genus to which it belongs: a group which contains numerous very distinct plants, which were once confounded together as varieties of the species now under review. From the British species of this section, except one, our *C. diaphanum* may be at once known by its larger size and more robust filaments; it is also well characterized by the lateral dichotomous ramuli given off all along the principal divisions of the frond, and by the gradually attenuated filaments. These last characters distinguish it from *C. nodosum* and *C. fastigiatum*.

231. **gracillimum** (*The very slender Ceramium*); frond excessively slender, of nearly equal diameter throughout, very flaccid and gelatinous, dichotomous; the branches set with minute, flabelliform, dichotomous ramuli; articulations colourless, those of the branches five or six times as long as broad, those of the ramuli very short; dissepiments opaque, purple; favellæ borne on the lateral ramuli, with a spreading, many-rayed involucre, *Harv. Phyc. Brit. pl.* 206. (ATLAS, Pl. LI. Fig. 232.)

Hormoceras gracillimum, *Kütz.*

Hab. On mussel-shells, and on *Corallina officinalis* and other small Algæ, exposed at extreme low-water. Annual. September.

This species has a softer and more gelatinous substance than any British *Ceramium*, and this character, with its extreme tenuity, and the minute, fastigiate lateral branchlets, readily distinguish it from any of the section of the genus to which it belongs. *C. gracillimum* is the smallest and most slender of our British *Ceramia*. So slender are its threads, so flaccid, and so densely crowded together, that it is almost impossible to display them properly on paper. They almost invariably become entangled toge-

ther, and when once this has occurred, it is in vain to attempt their disentanglement.

232. **strictum** (*The straight Ceramium*); frond capillary, nearly equal, membranaceous, irregularly dichotomous, the lower forkings distant, the upper closer, all the divisions erect and straight, with narrow, acute axils; the apices straight or slightly hooked inwards; articulations colourless, those of the lower dichotomies from three to four times as long as broad, of the upper gradually shorter; dissepiments (smooth or hairy) opaque, purple; favellæ near the tips of the branches, involucrate; tetraspores erumpent, bursting from the dissepiments of the larger branches, quadrifarious, *Harv. Man. ed.* 2. *p.* 164. (ATLAS, Pl. LI. Fig. 233.)

Gongroceras strictum, *Kütz.*

Hab. On mussel-shells, corallines, etc., in tide-pools, near low-water mark.

A beautiful species, and a *tolerably* definite one, considering the genus to which it belongs. It is known from *C. nodosum* by its less patent branching, its more purple colour, and different disposition of the tetraspores, besides minor characters, more readily taken in by the eye than the ear. Sometimes the branches are quite smooth, and at other times every node of the upper branches and ramuli is densely clothed with long, flexible hairs, which appear to be the same pubescence that Kützing describes, and on the presence of which he founds his genus *Trichoceras*.

233. **nodosum** (*The knobbed Ceramium*); frond capillary, of equal diameter throughout, rigid, dichotomous, excessively divided, fastigiate; the axils very patent; articulations pellucid, those of the middle of the stem from four to six times as long as broad, the upper gradually shorter; dissepiments swollen; tetraspores erumpent, two or three together on the outer edge of short, accessory ramuli; favellæ at the apex of accessory ramuli, *Harv. Phy. Brit. pl.* 90. (ATLAS, Pl. LI. Fig. 234.)

Hormoceras nodosum, *Kütz.* Ceramium diaphanum, var., *Wyatt.* C. rigidulum, *Griff.* C. tenuissimum, *J. Ag.*

Hab. On sandy shores, often at the roots of *Zostera*.

This species is generally known to British botanists, though perhaps not under the name here given. It is distinguished from those most nearly allied to it by a certain harshness to the touch, or rigidity, as well as by its very patent forking. In these respects it differs from *C. fastigiatum*, which it most nearly resembles.

234. **fastigiatum** (*The level-topped Ceramium*); frond capillary, of equal diameter throughout, flaccid, dichotomous, level-topped; the axils acute; articulations pellucid, those of the middle of the stem from four to six times longer than broad, the upper gradually shorter, and coloured; dissepiments coated with coloured cells; favellæ small, subterminal, subtended by three or four involucral ramuli, *Harv. in Hook. Lond. Journ. Bot. v.* 1. *p.* 303. (Atlas, Pl. LI. Fig. 235.)
Gongroceras fastigiatum, *Ktz.*
Hab. On rocks, etc., near low-water mark; rare. Annual. Autumn and winter.

This is one of the rarest and most beautiful of the British species of *Ceramium*. It is nearly related to *C. nodosum*, particularly in ramification, and in the diameter of its filaments; but the substance is much more soft and tender than in that species, and the colour much brighter. The upper joints moreover in the present species are suffused with a beautiful carmine, and the axils are far less patent. The tufts are perfectly fastigiate, forming regular circular fans when displayed on paper.

235. **flabelligerum** (*The fan-bearing Ceramium*); frond subsetaceous, attenuated upwards, rigid, flabellately branched, irregularly dichotomous, with lateral forked ramuli, the apices acute, patent or somewhat incurved; articulations coated with coloured cellules, those of the lower branches about twice as long as broad, of the upper equal in length and breadth, each armed on the outer edge with a single, minute, subulate, coloured, three-jointed prickle; tetraspores erumpent, whorled round the joint; favellæ two- or three-lobed, berry-like, subtended by several patent, subulate ramuli, *J. Ag. Advers.* 27. (Atlas, Pl. LII. Fig. 238.)
Hab. South of England. Parasitical on the smaller Algæ between tide-marks. Annual. Summer and autumn. Rare.

The external habit of this species is so different from that of the other ciliated *Ceramia* that it can scarcely be confounded with any of them. It bears a much closer resemblance to a small specimen of *C. rubrum*, to which species there is much similarity both in the branching and in the length and structure of the joints; but from which it may be at once distinguished under the microscope by the minute prickle with which each of the joints is armed at its outer edge.

236. **echinotum** (*The prickly Ceramium*); frond slender, of nearly equal diameter throughout, rigid, repeatedly dichoto-

mous, frequently with lateral forked branchlets, fastigiate, the apices more or less involute; articulations pellucid, those of the middle of the stem three or four times longer than broad, the upper gradually shorter, the uppermost extremely short; dissepiments coloured, armed with numerous, slender, irregularly inserted, subulate, colourless, one-jointed prickles; tetraspores mostly solitary in each joint, erumpent along the outer margin of the filament; favellæ mostly bilobed, lateral, subtended by numerous, strongly incurved ramuli, *J. Ag. Advers. p.* 27. (Atlas, Pl. LII. Fig. 239.)

Hab. On rocks and stones, between tide-marks; and in tidal pools parasitic on various Algæ. Annual. Summer and autumn.

Mrs. Griffiths has for many years regarded the plant here figured, as being distinct from *C. ciliatum*, from which the nature and disposition of the prickles that clothe the joints in greater or less number at once distinguish it. In *C. ciliatum* there is a regular whorl of stout three-jointed prickles, all pointing upwards, round the centre of every joint; here we have several slender, one-jointed, needle-shaped prickles scattered irregularly, and pointing in various directions like the spines of a sea-urchin. In young specimens the joints, at least the upper ones, are filled with a purplish fluid which makes the frond, while living, appear to be fully coloured, not diaphanous; when dried this fluid is dispersed and the true nature of the joint is obvious.

237. **acanthonotum** (*The one-spined Ceramium*); frond slender, of nearly equal diameter throughout, rigid, repeatedly dichotomous, fastigiate, the apices strongly involute; articulations pellucid, those of the middle of the stem several times longer than broad, the upper gradually shorter; dissepiments coloured, armed on the outer edge with a single, robust, broadly subulate, coloured, three-jointed prickle; tetraspores erumpent, whorled round the joint; favellæ roundish, subtended by a solitary, incurved ramulus, *Carm. Alg. Appin.* (Atlas, Pl. LII. Fig. 240.)

Ceramium ciliatum, var., *Harv.* Acanthoceras Shuttleworthianum, *Ktz.*

Hab. On exposed rocks, near low-water mark, and on the smaller Algæ. Annual. Summer and autumn. Not uncommon.

Ceramium acanthonotum is much darker in colour than *C. ciliatum*, often an intense purple; and the tufts are usually shorter, and more densely compacted. These cha-

racters however are not sufficiently definite, and an appeal to the microscope may be necessary. This at once displays the admirable character by which the species may be recognized, namely, the *solitary*, three-jointed spine, arming the outer margin of every joint. The only other known British *Ceramium* which has a spine at all similar, is *C. flabelligerum*, but that is at once distinguished by its joints being coloured, not hyaline; not to speak of its very different branching, and the smallness of its spine.

238. **ciliatum** (*The ciliated Ceramium*); frond slender, of nearly equal diameter throughout, rigid, repeatedly dichotomous, with or without lateral branchlets, fastigiate, the apices strongly involute; articulations pellucid, those of the middle of the stem from three to four times longer than broad, the upper gradually shorter; dissepiments coloured, furnished with a whorl of robust, subulate, three-jointed prickles; tetraspores alternating with the prickles; favellæ subtended by two or three ramuli, *Ducluz, Ess. p.* 64. (Atlas, Pl. LII. Fig. 241.)

Ceramium diaphanum, var., *Duby*. Echinoceras ciliatum, *Ktz.* Boryna ciliata, *Gratel.* Conferva ciliata, *Ellis.* C. pilosa, *Roth.*

Hab. On rocks and stones in the sea, either in tide-pools or exposed at low-water; also attached to Corallines and other Algæ. Annual. Summer.

Under the common name *ciliatum* at least three distinct varieties of *Ceramium*, now regarded as distinct species, have hitherto been confounded by British botanists—*C. echionotum*, *C. acanthonotum*, and the present species. To the naked eye they have very much the same appearance, and to the touch the same peculiarly harsh feel, and it is not till we submit small portions to the test of the microscope that their differences are perceived. Obvious differences may then be observed in the spines with which the joints are armed, and these appear to be constant.

LXXXIII. SPYRIDIA.

239. **filamentosa** (*The filamentose Spyridia*); frond irregularly branched, sub-opaque; branches tapering at the base, more or less densely clothed with setaceous ramuli; joints of the stem very short, of the ramuli once and a half as long as broad, *Harv. in Hook. Br. Fl. v.* 2. *p.* 337. (Atlas, Pl. LIII. Fig. 244.)

Spyridia crassiuscula, *Ktz.* S. setacea, *Ktz.* S. nudiuscula, *Ktz.*

Fucus filamentosus, *Wulf.* F. friabilis, *Clem.* Ceramium filamentosum, *Ag.* Hutchinsia filamentosa, *Ag.* Conferva Griffithsiana, *E. Bot.*

Hab. Southern coasts of England, in several places; but rare. On submarine rocks, near low-water mark. Perennial. Summer.

This plant, which is very local on the British coasts, although found in considerable plenty in a few places, is interesting in a geographical view, being a native of warm latitudes and reaching to its northern limit in this country. Until very recently, when Mr. Ralfs discovered it on the Welsh coast, it had only been found in Britain on the extreme southern shores. It is more plentiful in the Channel Islands, and along the French coast, and abounds in the Mediterranean; but the finest specimens are found in the tropical ocean. In Britain it is very generally much discoloured, being of a dirty grey or brownish cast, a deformity caused by its growing in comparatively shallow water, and in places exposed to strong sunshine.

LXXXIV. GRIFFITHSIA.

240. **equisetifolia** (*The Equisetum-leaved Griffithsia*); stems robust, cartilaginous, whorled throughout with closely imbricated, incurved, many times dichotomous ramuli, *Ag. Syn. p.* 28. (Atlas, Pl. LIII. Fig. 245.)

Halurus equisetifolius, *Ktz.* Conferva equisetifolia, *Lightf.* C. imbricata, *Huds.* C. cancellata, *Roth.* Ceramium equisetifolium, *DC.*

Hab. Frequent on the southern and western shores of England and Ireland. On marine rocks, at extreme low-water mark. Perennial. Summer.

Griffithsia equisetifolia was first described by Lightfoot in the year 1777, in his 'Flora Scotica,' on the authority of a specimen communicated by Mr. Yalden from the Frith of Forth; and it is not a little remarkable that though the plant has been found on most parts of the English and Irish coasts, since Lightfoot's time, yet no more recent instance of its occurrence in Scotland has been recorded, nor have I received it from any of my Scotch correspondents. While in fructification it perfectly agrees with others of the genus, it differs considerably in habit from all, with the exception of *G. simplicifilum*, a plant which ought perhaps rather to be considered as a slender variety of the present, than as a distinct species.

241. **simplicifilum** (*The simple-thread Griffithsia*); stems slender, irregularly branched, whorled with imbricated, straight, once-forked ramelli, *Ag. Sp. Alg. v.* 2. *p.* 134. (ATLAS, Pl. LIV. Fig. 247.)

Ceramium simplicifilum, *DC.* Halurus simplicifilum, *Ktz.*

Hab. On rocks, etc., near low water-mark, and at a greater depth. Annual. Very rare.

The characters by which this plant is to be known from *G. equisetifolia* are, the more slender branches, the more distant and less frequently forked and straighter ramuli, and the greater proportionate length of the articulations. Usually the colour of *G. simplicifilum* is much brighter than that of *G. equisetifolia*, but this character is not always to be depended upon.

242. **barbata** (*The pencilled Griffithsia*); filaments dichotomous, slender; articulations slightly pyriform, from five to eight times longer than broad, those near the apices of the branches emitting opposite or whorled, byssoid, dichotomous fibres (or ramuli) to which the tetraspores are attached; favellæ stalked, *Ag. Syst. p.* 145. (ATLAS, Pl. LV. Fig. 250.)

Conferva barbata, *E. Bot.*

Hab. Parasitical on the smaller Algæ, in tide-pools. Annual. Summer. Very rare, and seemingly confined to the coasts of the British Channel.

It is only necessary to glance at the figure of this species and compare it with those of the other species of *Griffithsia*, to see the strong characters by which the present is distinguished. Here the few last articulations of all the branches are furnished with slender, byssoid fibres, and on these fibres the tetraspores are borne. In tenuity of frond there is a resemblance to *G. Devoniensis*, and in the pyriform articulations to *G. corallina*, but the byssoid ramuli are peculiarly its own.

243. **Devoniensis** (*The Devonshire Griffithsia*); filaments very slender, gelatinous, flaccid, dichotomous, the lower axils patent, the upper acute; articulations cylindrical, 7–8 times as long as broad; joints constricted; involucres whorled round the joints of the branches, *Harv. Phy. Brit. pl.* 16. (ATLAS, Pl. LV. Fig. 251.)

Hab. South of England. Muddy sea-shores, in deep water; rare.

G. Devoniensis belongs to the section of the genus typified by *G. corallina*, from which species the smaller size, more slender filaments, and cylindrical articulations

sufficiently distinguish it. It agrees better in these respects with the rare *G. barbata*, but differs in its inflorescence, if I may venture to use that term to express the disposition of fruit.

244. **corallina** (*The coral-like Griffithsia*); filaments dichotomous, incrassated, gelatinous; axils patent; joints swollen upwards, pear-shaped, the ultimate ellipsoid; involucres sessile, those containing tetraspores whorled round the branch, those containing favellæ lateral, *Ag. Syn. p.* 28. (Atlas, Pl. LV. Fig. 252.)

Callithamnion corallinum, *Lyngb.* Conferva corallina, *Linn.* C. corallinoides, *Linn.* C. geniculata, *Ellis.*

Hab. On rocks near low-water mark, generally in deep pools. Annual. Summer. Not uncommon.

This is one of those beautiful and not very uncommon plants which can scarcely fail to attract the notice of the observer who has once made the marine Flora his study. We consequently find it among the species which soonest attracted notice. It is one of the few marine *Confervæ* figured by Dillenius, and having a place in the early editions of Linnæus. The clear red of its glossy, beaded fronds is well expressed in the specific name *corallina*, bestowed upon it from an early period. It is found in every part of the European waters, from the shores of Iceland to those of Italy, and I have received specimens from the shores of Van Diemen's Land.

245. **secundiflora** (*The side-fruited Griffithsia*); filaments ultra-setaceous, somewhat gelatinous but firm, irregularly dichotomous, the lesser divisions flabellate; axils acute; branchlets fastigiate, obtuse, not tapering to a point; articulations cylindrical, two to four times as long as broad, with a very wide border; "involucres on very short, lateral peduncles." *J. Ag. in Linn. v.* 15. *p.* 39. (Atlas, Pl. LIV. Fig. 246.)

Griffithsia crassa, *Kütz.* G. intermedia, *Lenorm.* G. corallina, var., *Bonn.* Ceramium corallinum, var., *Desmaz.* C. Desmazieri, *Crouan.*

Hab. Plymouth. On rocks, at extreme low-water mark. Perennial?

From *G. setacea* this plant may, at once, be known by its large size, its comparatively shorter joints, and more lubricous substance; but especially by the very obtuse, cylindrical, upper ramuli, which do not taper to a point;

but are of equal diameter throughout. From *G. corallina*, which in many respects it resembles, its cylindrical articulations and different inflorescence distinguish it.

246. **setacea** (*The bristly Griffithsia*); filaments setaceous, straight, rigid, dichotomous, or sub-dichotomous; axils very acute; lesser branches sometimes opposite, attenuated to a point, erect; articulations cylindrical, five or six times longer than broad; involucres (of both kinds) pedunculate, lateral, *Ag. Syn. p.* 28. (Atlas, Pl. LV. Fig. 253.)

Conferva setacea, *Ellis.*

Hab. On the perpendicular sides of deep rock-pools, near low-water mark, under the shade of larger Algæ. Perennial. Fruiting in spring and summer.

A long-known and beautiful plant, found on all the British shores, and widely dispersed through the ocean. When quite fresh it is remarkably crisp and firm in substance, the points of its filaments standing firmly out when the tuft is removed from the water. But it very rapidly becomes flaccid, and if dropped into fresh water, the membranous walls of its filaments burst asunder with violence, and with a sharp crackling noise, discharging the contents of the cells into the water. These form a fine powder of a brilliant carmine-colour, and might, no doubt, be used as a pigment if the plant could be collected in sufficient quantity. Paper stained with this powder retains its brilliancy of colour in the herbarium for many years. These remarks however apply equally to other species of the genus.

LXXXV. WRANGELIA.

247. **multifida** (*The many-slit Wrangelia*); stems setaceous, pinnate or bipinnate, articulated, each joint bearing a pair of opposite, slender, pinnato-multifid, incurved ramuli, or whorled with numerous sub-dichotomous ramuli; joints of the stem many times longer than broad, *J. Ag. Alg. Medit. p.* 79. (Atlas, Pl. LIV. Fig. 248.)

Griffithsia multifida, *Ag.* Callithamnion multifidum, *Ktz.* Ceramium verticillatum, *Ducluz.* C. Casuarinæ, *DC.* Conferva multifida, *Huds.*

Hab. Frequent on the southern shores of England; and west of Ireland. On the perpendicular sides of deep marine pools near low-water mark, under the shade of other Algæ.

The genus *Wrangelia*, to which, following the recent views of the younger Agardh, I remove this plant, was

founded by Bishop Agardh on a Mediterranean species, which agrees in its fructification with our *W. multifida*, but which has an inarticulate, or rather an opaque, *internally* jointed stem. The structure of the favellæ and the disposition of the tetraspores are different from what occur in *Griffithsia*, and the branching of the frond is more pinnate than dichotomous. Some fine species of *Wrangelia* are found in Tasmania and New Holland.

LXXXVI. SEIROSPORA.

248. **Griffithsiana** (*Mrs. Griffiths's Seirospora*); frond rosy, filamentous; stem articulated, one-tubed, the articulations traversed by jointed filaments; branches jointed, one-tubed; fruit, oval tetraspores disposed in terminal, moniliform strings; favellæ?—*Harv. Phyc. Brit. pl.* 21. (Atlas, Pl. LIV. Fig. 249.)

Callithamnion seirospermum, *Griff.* C. versicolor, var., *Harv.*

Hab. On rocks and stones in the sea, in four to six fathoms water. Rare. Annual. Summer.

This beautiful plant was discovered by Mrs. Griffiths in the autumn of 1833, and by that acute observer was at once pronounced to be a new species. I was not so confident of its claims to this distinction, and first described it as a variety of *Callithamnion versicolor*, chiefly remarkable for a curious modification of fruit. There is indeed a close resemblance to strong growing plants of *C. versicolor*, so close that we are driven to look to the fructification for marks of difference. Here however the characters are so broadly defined, that if we regard the fruit of our *Seirospora* as being normal, according to the view first taken by Mrs. Griffiths, and latterly, though with some hesitation and reluctance, adopted by me, we are compelled to form a new genus for its reception. In *Callithamnion* the tetraspores are borne laterally along the ramuli; here the ramuli themselves are converted at maturity into strings of tetraspores, a tetraspore being formed within each of the articulations of the ramulus.

LXXXVII. CALLITHAMNION.

249. **Plumula** (*The little feather Callithamnion*); stems distichously branched, subdichotomous, articulated; each articulation bearing a pair of short, recurved plumules, pectinated on their upper margin, *Lyngb. Hyd. Dan. p.* 127. (Atlas, Pl. LV. Fig. 254.)

Ceramium Plumula, *Ag.* Conferva Plumula, *Ellis.* C. Turneri, *Smith.*

Hab. On rocks and Algæ, near low-water mark, and in four to fifteen fathoms water. Annual. Summer.

A very charming plant, though a common one; common, not merely on the shores of Europe, but dispersed far and wide through the ocean, north and south of the Line. The characters of the species are strongly marked, and once seen, cannot be forgotten. Would that others of this beautiful genus were equally constant! Here every articulation, without exception, through the whole plant, bears its pair of comb-like branchlets. Under the microscope, therefore, *Cal. Plumula* cannot well be mistaken. But, notwithstanding this perfect regularity of branching, specimens differ much in luxuriance, and consequently in outer aspect; and we might enumerate two varieties, in one of which the combs are twice as long as in the other, and more delicate.

250. **cruciatum** (*The crossed Callithamnion*); filaments densely tufted, irregularly and rather sparingly branched; branches alternately divided, jointed, furnished at each joint with two to four opposite or quaternate, slender, short, pectinato-pinnate ramuli; tetraspores elliptical, subsessile, borne on the lowermost joints of the ramuli, *Ag. Syst. Alg. v.* 2. *p.* 160. (Atlas, Pl. LV. Fig. 255.)

Callithamnion pumilum, *Harv.*

Hab. On mud-covered rocks, near low-water mark. Annual. Summer. Rather rare.

A very distinct and beautiful species of this charming genus, and one which is very widely distributed. It is not however subject to much variation, except of a very minor character. The opposite or quaternate pinnulated ramuli constantly mark it. In some individuals the joints of the stem are much shorter, the ramuli more dense, and the whole plant very small. These, before I was well acquainted with the variations of *C. cruciatum*, I was disposed to regard as a distinct species, which I described under the name of *pumilum*, in the 'British Flora.' A better acquaintance with the species has shown that this view cannot be maintained. An excellent mark for *C. cruciatum*, by which it may be known at a glance, lies in the very dense tufts terminating the branches, consisting of undeveloped ramuli.

251. **floccosum** (*Pollexfen's Callithamnion*); frond capillary, very flaccid, remotely much branched; branches alternate, erecto-patent, articulated; every joint producing a pair of opposite, simple, subulate, erecto-patent, minute ramuli; tetraspores elliptical, pedicellate, produced on the ramuli, near their base, *Ag. Sp. Alg. v.* 2. *p.* 158. (Atlas, Pl. LVII. Fig. 263.)

Callithamnion Plumula, *Lyngb.* C. Pollexfenii, *Harv.* Conferva floccosa, *Fl. Dan.*

Hab. North of Scotland. On submarine rocks, near low-water mark. Annual. Spring. Very rare.

C. floccosum would appear to be peculiarly a northern plant, confined to the coasts of Norway and the north of Scotland, in both which countries it is of extreme rarity.

252. **Turneri** (*Turner's Callithamnion*); filaments rising from creeping fibres, simple or repeatedly branched, once or twice pinnated with opposite, spreading, simple ramuli; articulations of the main filaments 5–10 times longer than broad; tetraspores clustered, subracemose or corymbose, favellæ involucrated, stalked, *Ag. Syst. Alg. v.* 2. *p.* 100. (Atlas, Pl. LVIII. Fig. 266.)

Callithamnion repens, *Lyngb.* C. variabile, *Ag.* Ceramium Turneri, *Roth.* C. repens, *Ag.* Conferva Turneri, *Dillw.* C. repens, *Dillw.* C. tenella, *Dillw.*

Hab. Parasitical on other Algæ, between tide-marks. Annual. Summer. Not uncommon.

This pretty little species of *Callithamnion*, named by Dr. Roth after its discoverer, Mr. Dawson Turner, was first observed on the Norfolk coast, and has since been found on most of the shores of Europe, where it not uncommonly creeps over the fronds of various small Algæ. The fructification differs in some respects from that of other *Callithamnia*, and shows an approach to *Griffithsia*, especially in the involucrated favellæ. The tetraspores are however not so regularly disposed as in that genus; and the habit is more like that of *Callithamnion*.

253. **barbatum** (*The bearded Callithamnion*); stems (rising from creeping filaments?) much and irregularly branched; branches mostly alternate, long, subsimple, naked, or pinnulated with minute, opposite, spine-like, erecto-patent ramuli; articulations twice or thrice as long as broad, tetraspores elliptic-oblong, with a wide limbus, sessile on the sides of the pinnulæ, *Ag. Syst. Alg. v.* 2. *p.* 181. (Atlas, Pl. LVI. Fig. 256.)

Callithamnion Ralfsii, *Harv.*

Hab. South of England. On mud-covered rocks, in the sea, between tide-marks. Very rare. Perennial?

To the naked eye this species, unless closely examined, resembles a ragged specimen of *C. floridulum*, though when compared under a lens with that plant, the two are seen to be abundantly different. The short opposite ramuli which feather the ends of the branches of *C. barbatum*, and which are most abundant in summer specimens, though perhaps always to be found in degree, form the striking mark of the species.

254. **Pluma** (*The feather Callithamnion*); stems rising from creeping filaments, erect, subsimple or alternately branched; branches naked below, the upper half pinnated with short, erect, closely set, opposite ramuli; articulations from two to four times as long as broad; tetraspores globose, either terminating shortened pinnules, or placed on little stalks near the base of the pinnule, *Ag. Sp. Alg. v.* 2. *p.* 162. (Atlas, Pl. LVIII. Fig. 267.)

Callithamnion Plumula, var., *Lyngb.* Ceramium Pluma, *Ag.* Conferva Pluma, *Dillw.*

Hab. Parasitical on the stems of *Laminaria digitata*, rather rare. Annual. Summer.

A beautiful little parasite, pretty much confined to the stems of *Laminaria digitata*, which it sometimes clothes in patches, looking like shreds of crimson velvet. Dillwyn's figure represents the upright stem as perfectly simple, the whole plant strictly resembling a little feather. I have sometimes met it so, but it is more usual to find one or two branches rising from the lower part, as shown in our figure. *C. Pluma* is nearly allied to *C. Turneri*, from which it chiefly differs in the smaller size and shorter articulations, and in having the lower part of the stem and branches constantly naked.

255. **arbuscula** (*The bush Callithamnion*); stems naked below, inarticulate, robust, cartilaginous, the main divisions set with shorter branches, which are densely clothed on all sides with minute, imbricated, pinnated ramuli (plumules); ultimate pinnules simple or forked, recurved, acute, articulated, the articulations twice as long as broad; tetraspores globose, numerous, sessile on the upper edge of the pinnules, *Lyngb. Hyd. Dan. p.* 123. *t.* 38. (Atlas, Pl. LVII. Fig. 262.)

Phlebothamnion arbuscula, *Ktz.* Dasya spongiosa, *Ag.* Conferva arbuscula, *R. Br.*

Hab. Abundant on the western shores of Scotland and Ireland; rare on the eastern. On rocks and mussel-shells, near low-water mark, usually in places left bare on the recess of the tide; also in tide-pools. Perennial. Summer and autumn.

The most robust and bushy of all the British *Callithamnia*, and therefore well named *Arbuscula*. The main stem is often upwards of a line in diameter, and divided into several stout branches, densely clothed with finely divided ramuli. The colour is always very dark, varying from brownish to a more or less vivid vinous purple. No species can well be confounded with the present, except, perhaps, very luxuriant specimens of *C. spongiosum*, but the microscopic characters of that species are extremely different.

256. **Brodiæi** (*Brodie's Callithamnion*); stem sub-opaque, veiny, obscurely jointed, slender, simple, furnished throughout with densely inserted, patent, lateral branches; branches furnished at each joint with short, quadrifarious, secondary branches with a narrow hastate outline; plumules alternate, subsimple, pinnate, ovate, their pinnules patent, frequently with a few secund processes near the apex; tetraspores oval, sessile near the tips of the pinnules, or on their accessory processes; favellæ bilobed, on the secondary branches, *Harv. in Hook. Br. Fl. v.* 2. *p.* 105. (Atlas, Pl. LVI. Fig. 257.)

Hab. Parasitical on Algæ, near low-water mark. Annual. Summer. Rare.

Cal. Brodiæi has much the habit of a small specimen of *C. tetragonum*; the conical outline, undivided shrubby stem, and lateral branches, are common to both. But the microscopic characters show a much nearer affinity with *C. Hookeri*, to some varieties of which it makes a very near approach. In the individuals producing *tetraspores*, which are always more slender and more regularly branched than those which bear *favellæ*, the pinnules are pretty constantly furnished with short, secund ramuli in their upper half. In *C. Hookeri* such ramuli are either absent or are alternate, and more patent. In the length of the joints there is not much difference, and both species have sub-opaque stems, traversed by densely packed articulated veins.

257. **tetragonum** (*The four-angled Callithamnion*); outline of the frond ovate; stem cartilaginous, sub-simple, setaceous, somewhat opaque, veiny, set with subquadrifarious lateral branches, furnished sometimes with a second or third series; penultimate branches pellucidly jointed, slender, elongate, set with short, alternate, patent, level-topped plumules, the lowest of which are simply pinnate, the sub-bipinnate; ramuli incurved, narrowed at the base, suddenly acuminate, their articulations once and a half as long as broad, constricted at the joints; tetraspores very minute, oval, near the tips of the ramuli, *Ag. Sp. v.* 2. *p.* 176. (Atlas, Pl. LVII. Fig. 264.)

Ceramium tetragonum, *Ag.* Conferva tetragona, *With.*

Hab. Parasitical on the larger Algæ; commonly on the fronds of *Laminaria digitata*. Annual. Summer.

Callithamnion tetragonum, when fully grown, is one of the largest and most robust and shrubby of the British species of this charming genus, and, seen under water, is an object of much beauty. In drying, though it sufficiently retains its form, it loses considerably in elegance, from the pressing together of the delicate quadrifarious ramuli, which in a state of nature stand out from the branchlets, giving to the different parts of the frond a roundness, without confusion or matting together of the minutest part. These, in dried specimens, become confounded together. It rapidly changes colour in fresh water, assuming a brilliant orange-tint, and giving out a rose-coloured powder. Though a species of large size, its *tetraspores* are exceedingly small, much smaller in proportion than those of most other species, and, being borne near the tips of the smaller and more crowded ramuli, may easily escape detection. The *favellæ*, on the contrary, are of large size, and easily seen.

258. **brachiatum** (*The armed Callithamnion*); outline of the frond lanceolate; stem cartilaginous, subsimple, setaceous, somewhat opaque, veiny, set with subquadrifarious, lateral branches, often furnished with a second series; penultimate branches pellucidly jointed, slender, elongate, set with short, alternate, very erect, level-topped plumules, the lowermost of which are most simple; ramuli erect, subulate, not narrowed at base, gradually tapering to a fine point, their articulations twice as long as broad, cylindrical; tetraspores minute, oval, near the tips of the ramuli, *Bonnem.* (Atlas, Pl. LVI. Fig. 258.)

Callithamnion Harveyanum, *J. Ag.* C. granulatum, *Harv.*

Hab. Parasitical on the larger Algæ, frequently on *Laminaria digitata*, *Codium tomentosum*, etc.

The character by which *C. brachiatum* appears *essentially* to differ from *C. tetragonum*, is to be found in the ultimate ramuli, which in this are constantly subulate, gradually tapering from the base to the apex; and in that are suddenly acuminate, or, as it were, *mucronate*. This is what originally induced me to admit the species, which I found indicated in the unpublished 'Algæ Appinenses' of Carmichael, under the name *C. fruticulosum;* and so far as my observations have gone, this character appears to be constant. Minor and less important distinctions may be taken from the length of the joints, and their *form*, which is cylindrical in the present species and oval in *C. tetragonum*. Both plants are equally common, and found in the same situations.

259. **tetricum** (*The rough Callithamnion*); rigid, shrubby; stem and branches robust, densely covered with ramuli, shaggy below, plumulate above; plumules crowded, quadrifarious, simply pinnate; pinnæ acute, tapering to the base, erecto-patent; articulations twice or thrice as long as broad; tetraspores elliptical, minute, sessile on short lateral processes of the pinnæ, *Ag. Sp. Alg. v.* 2. *p.* 179. (ATLAS, Pl. LVI. Fig. 259.)

Phlebothamnion tetricum, *Ktz.* Conferva tetrica, *Dillw.*

Hab. South of England, and south and west of Ireland. On the perpendicular faces of rocks within tide-marks, from half-tide level to low-water mark. Perennial. Summer.

This is the coarsest of the British *Callithamnia*, resembling in its bushy habit, shaggy tufts of *Sphacelaria scoparia*, and is often of a very dark brown colour, with little trace of the purple endochrome characteristic of the genus. At other times, much more shaggy specimens with a brighter colour are found, and some of these resemble large specimens of *C. Borreri*. Specimens collected at various seasons and from different localities differ much in the abundance and regularity of the plumules, as well as in the greater or less development of the hair-like ramuli.

260. **Hookeri** (*Hooker's Callithamnion*); stem setaceous, inarticulate or nearly opaque, with traces of joints, simple, set with one or more series of alternate, spreading, flexuous branches, the smaller of which are articulated, and all densely plumulate; plumules patent, naked below, pinnate

or subbipinnate above; the pinnæ or pinnules subhorizontal or divaricate, the lowest longest; articulations twice or thrice as long as broad; tetraspores numerous, sessile on the pinnules; favellæ terminal, binate, *Ag. Sp. Alg. v.* 2. *p.* 179. (ATLAS, Pl. LVIII. Fig. 266.)

Callithamnion lanosum, *Harv.* C. spinosum, *Harv.* Phlebothamnion Hookeri, *Ktz.* P. spinosum, *Ktz.* Ceramium Hookeri, *Ag.* Conferva Hookeri, *Dillw.*

Hab. On various Algæ, between tide-marks; also on rocks near low water-mark, and at a greater depth. Annual. Summer.

A common but very variable species, and yet not difficult to understand when a few leading features are kept in view. Its most striking characters are the opaque stem and branches, the short articulations, and the very patent or divaricated ramuli, frequently pinnulated above. It verges on the one hand to *C. roseum*, and on the other to *C. Borreri* and to *C. polyspermum*, but is readily recognized from each of these by some one of its characters. *C. Hookeri* is named in honour of Sir W. J. Hooker, by whom it was first discovered.

261. **roseum** (*The rosy Callithamnion*); stems much and loosely branched; secondary branches long, flexuous, subdistichously plumulate; plumules lax, with a roundish outline, crowded towards the tops of the branches, simply pinnate; pinnæ long, spreading, curved; articulations of the stem and branches four and five times as long as broad, more or less filled with veins; those of the pinnæ twice or thrice as long as broad; tetraspores elliptical, four or five on each pinna, from the lower joints; favellæ tufted, *Lyngb. Hyd. Dan. p.* 126. *t.* 29 (?). (ATLAS, Pl. LVI. Fig. 260.)

Phlebothamnium roseum, *Ktz.* Ceramium roseum, *Roth.* Conferva rosea, *E. Bot.*

Hab. On rocks and the larger *Fuci*, near low-water mark; frequently in estuaries, or muddy places. Annual. Summer. Not uncommon.

Callithamnion roseum is one of the longest-described of the genus, and ought therefore, one would think, to be the best-known. But, as with many old species, several plants which are now distinguished, were formerly confounded under this name, and thus it becomes a doubtful matter to which of the modern species the original synonym *roseum* attaches. As far however as the British Flora is concerned, our notions of *Cal. roseum* are tolerably definite.

262. **byssoideum** (*The byssus-like Callithamnion*); stems ex-

ceedingly slender, flaccid, and byssoid, much divided; the branches lanceolate in outline, virgate, set with numerous long, slender, flexuous, pinnate or subbipinnate plumules; articulations of the branches eight times, of the ramuli four times as long as broad; tetraspores, one or two, sessile on the pinnules, elliptical; favellæ binate, subterminal, *Arn. MSS. Harv. in Hook. Br. Fl. v.* 2. *p.* 342. (Atlas, Pl. LVIII. Fig. 269.)

Hab. On several Algæ, in tide-pools near low-water mark; on *Codium tomentosum* especially. Annual. Summer.

E. byssoideum is one of the softest and most gelatinous of the genus, having exceedingly slender fronds, growing in dense tufts. To the naked eye it frequently bears much resemblance to *C. corymbosum*, so much that it sometimes requires a microscope to determine to which species the specimen under examination may belong. The ultimate branching and the position of the tetraspores will then afford an easily seen character, by which the two plants may be distinguished. From *C. roseum* our plant is chiefly known by its much greater delicacy and softer substance, and its adhering much more closely to paper, and being more glossy when dry.

263. **polyspermum** (*The many-seeded Callithamnion*); tufts globose; filaments slender, delicate, loosely much-branched, irregularly divided below, distichously plumulate above; plumules long and narrow, simply pinnate; pinnæ short, simple, patent, acute, spine-like; articulations of the branches with a very narrow coloured tube, four or five times as long as broad, of the ramuli short; tetraspores globose, lining the inner face of the pinnæ, *Ag. Sp. Alg. v.* 2. *p.* 169. (Atlas, Pl. LVIII. Fig. 270.)

Callithamnion Grevillii, *Harv.* C. roseum, *Grev.* C. purpurascens, *Johnst.* Phlebothamnium polyspermum, *Ktz.*

Hab. On various Algæ, between tide-marks; frequently on *Fucus vesiculosus* and *F. serratus*. Annual. Summer.

A common species, variable in its characters, gradually approaching *C. roseum* on the one hand, and *C. Hookeri* on the other. The typical form of the species is remarkable for the short, awl-shaped, simple pinnæ, beaded on the inner face with globose tetraspores. It more frequently grows on the coarser *Fuci* than any other species, and sometimes clothes them with densely set, globose tufts, which in old-age become blended together, concealing the greater part of the plant on which they grow.

264. **purpurascens** (*The purple Callithamnion*), *Smith, Eng. Bot. t.* 2465.

This species, described by Smith and figured in the 'English Botany,' is unknown to me.

265. **fasciculatum** (*The fasciculate Callithamnion*); tufted; branches erect, flexuous, level-topped; plumules elongate, erect, linear-obovate, truncate; pinnæ long and flexuous, the lowermost simple, appressed, the upper erecto-patent, branching toward the tip; articulations of the branches veiny, thrice as long as broad, of the pinnæ once or twice as long as broad, with contracted dissepiments, *Harv. in Hook. Br. Fl. v.* 2. *p.* 343. (Atlas, Pl. LVIII. Fig. 271.)

Hab. Yarmouth.

The testimony of the existence of this species rests upon a single specimen preserved in the herbarium of Sir W. J. Hooker, and collected early in the present century. It will be seen by my figure in the 'Phycologia' that the habit, to the naked eye, is that of *C. corymbosum*, while the microscopic characters are nearer those of *C. Borreri* than those of any other species. The diameter of the filament is greater than that of the usual state of *C. Borreri*, and much greater than that of *C. roseum*, and the constricted dissepiments of the ramuli are very characteristic.

266. **Borreri** (*Borrer's Callithamnion*); much branched, subdistichous, rigid or flaccid; branches set with distichous plumules which are bare of ramuli in their lower half and simply pinnate in their upper; pinnæ long, patent, subulate, simple (or ramulose at top), the lowermost longest; articulations of the branches 2–5 times, of the pinnæ about twice as long as broad; tetraspores roundish, sessile on the inner face of the pinnæ; favellæ two-lobed, near the apex of the lesser branches, *Ag. Sp. Alg. v.* 2. *p.* 170. (Atlas, Pl. LIX. Fig. 272.)

Callithamnion seminudum, *Ag.* Ceramium pinnulatum, *Ag.* C. miniatum, *Ag.* Conferva Borreri, *Smith.*

Hab. On mud-covered rocks near low-water mark. Annual. Summer. Rather rare.

This very handsome species, whose essential character consists in having the lower half of its plumules bare of ramuli, while the upper is pinnated, the pinnæ spreading like the rays of a fan, is nearly related to several other species, especially to *C. roseum*, *C. polyspermum*, and *C. tripinnatum*; from the two former of which it is known

by the shape of its plumules, from the latter, chiefly by the absence of the axillary ramulus. Unlike as, at first sight, this plant may appear to *C. gracillimum*, very luxuriant specimens closely resemble that species in habit, and exhibit a nearer approach in microscopic character than could be supposed.

267. **affine** (*The allied Callithamnion*); much branched and bushy; the stem rather opaque, full of veins; secondary branches long, having a roundish outline, alternately plumulate; plumules very narrow, simply pinnate; pinnæ short, erect, increasing in length upwards, alternate, crowded at top; articulations of the branches three or four times, of the pinnæ once and a half as long as broad; tetraspores generally solitary, rising from the basal cell of the pinnæ, *Harv. in Hook. Br. Fl. v.* 2. *p.* 344. (Atlas, Pl. LIX. Fig. 273.)

Hab. Parasitical on *Fuci*, between tide-marks. Annual. Summer.

If this plant be really entitled to specific rank, it is well named *affine*, for it appears to be akin to several other species, and to form an intermediate link between them. To *C. Hookeri* it is allied in habit, and in the opacity of the main stem, but here the resemblance ends, for the nature of the ramification is extremely different. With *C. roseum* we may also compare it, but the narrow plumules, with short, erect pinnules, afford a clear mark of distinction. Perhaps, after all, the nearest approach is to *C. polyspermum*, which has plumules equally narrow, and pinnules equally short, and which grows in similar places; but the *solitary*, *basal* tetraspores of *C. affine* seem to point to another species. The only specimen known was collected in 1832, by Dr. Greville, on the shore of Bute.

268. **tripinnatum** (*The three-pinnate Callithamnion*); frond distichously branched, capillary, decomposito-pinnate; plumules elongate, obovate, tripinnate above; upper pinnæ elongate, and pinnulate, lower short or abortive, each pinna having at its axil a minute pinnule; pinnules long, setaceous; joints of the stem 3–4 times, of the pinnæ about twice as long as broad; tetraspores oval, lateral on the axillary, and occasionally on the other pinnules, *Ag. Sp. Alg. v.* 2. *p.* 168. (Atlas, Pl. LVI. Fig. 261.)

Mertensia tripinnata, *Gratel.*

Hab. On marine rocks, at extreme low-water mark. Annual. April, May. Very rare.

Though the habit of *C. tripinnatum* is very like that of *C.*

gracillimum, it will be perceived that its microscopic characters have a greater resemblance to those of *C. Borreri*, from which the axillary ramulus and the distichous growth chiefly separate it. Only a very few specimens have been found, and these accompanied *C. thuyoideum*, growing on the perpendicular sides of steep rocks at the extreme limit of low water.

269. **gracillimum** (*The very graceful Callithamnion*); frond distichously branched, fan-shaped; stems capillary, decomposito-pinnate; upper plumules long, narrow, ovate or lanceolate, spreading, bi-tripinnate; joints of the stem cylindrical, three or four times, of the pinnæ two or three times longer than broad, veinless; tetraspores borne on the tips of the pinnules, *Ag. Sp. Alg. v. 2. p.* 168. (Atlas, Pl. LIX. Fig. 274.)

Hab. Atlantic coast of France, *Grateloup*. South and west of England. On mud-covered perpendicular rocks, near low-water mark. Annual. Summer.

This extremely elegant plant, perhaps the *most graceful* of the very beautiful genus to which it belongs, was first gathered on the shores of France by M. Grateloup. From Mrs. Griffiths (who discovered magnificent specimens growing along the mud-covered base of the harbour-pier at Torquay, in which locality it may be found in more or less plenty every summer) it received the very appropriate name of "*Fern-leaf*," aptly expressing the finely pinnated character of the branches, which do indeed closely resemble fairy ferns. As a species, it is very closely related to *Cal. thuyoideum*, with which it agrees in many characters, but from which it may be known by the greater proportionate length and breadth of the plumules, their more distichous arrangement and closer position, the shorter and more cylindrical joints of the main branches, and larger size of the frond. Both species agree in producing their *tetraspores* on the tips of the ultimate ramuli, a character by which they differ from all other British species with decompound-pinnate fronds.

270. **thuyoideum** (*The cypress Callithamnion*); stem capillary, undivided, set with alternate, distichous, repeatedly pinnate branches, with a narrow lanceolate outline; branches furnished with bipinnate or tripinnate plumules; articulations of the branches 2–6 times, of the pinnules about twice as long as broad; tetraspores borne on the tips of the ultimate

pinnule, *Harv. in Hook. Br. Fl. v.* 2. *p.* 346. (ATLAS, Pl. LIX. Fig. 275.)

Callithamnion thuyoides, *Ag.* Conferva thuyoides, *E. Bot.*

Hab. On rocks, near low-water mark; rare. Annual. Spring and summer.

One of the most *concinnate* of the *Callithamnia*, elegant in all its minute parts, and strictly neat in its mode of growth. In essential character it closely approaches *C. gracillimum*, from which it is more to be distinguished by habit than by any very definite character. *C. gracillimum* is a larger and more tufted plant, more irregular in ramification, with longer and more indefinite plumules, varying much in the composition of its ramuli. The plumules are very generally triply pinnate. *Favellæ* are much less commonly found on this species than tetraspores, and generally burst from the sides, and not the apex of a branchlet. Though found in many places, *C. thuyoideum* must be ranked among the rarer forms of the genus.

271. **corymbosum** (*The corymbose Callithamnion*); frond setaceous at the base, capillary and byssoid above, flaccid, gelatinous, excessively branched; secondary branches alternate, repeatedly dichotomous, subflabelliform, level-topped; ramuli many times forked, with patent axils; apices obtuse; articulations of the branches from eight to ten times as long as broad; tetraspores solitary, opposite the axils of the terminal forks, sessile, globose; favellæ binate, on truncated branches, *Ag. Sp. Alg. v.* 2. *p.* 165. (ATLAS, Pl. LIX. Fig. 276.)

Callithamnion versicolor, *Ag.* Phlebothamnion corymbosum, *Ktz.* P. versicolor, *Ktz.* Ceramium corymbosum, *Ag.* C. versicolor, *Ag.* Conferva corymbosa, *Eng. Bot.*

Hab. On the leaves of *Zostera*, the fronds of various Algæ, and attached to rocks and stones, near low-water mark. Annual. Summer.

A very variable plant: so much so, that most authors regard as distinct species two forms which I here bring together. Hitherto in British works we have recognized the original *Cal. corymbosum* of Eng. Bot., and the *Cal. versicolor* of Agardh, the differences between which are said to be, that the former is much more slender than the latter, with longer joints, a less evident stem, and a less pinnated branching. Some specimens are indeed very slender, and dichotomously divided, and others are robust, with an undivided stem and lateral branches; but between the most

extreme forms I have seen too many intermediate states to admit of my regarding them as belonging to more than one specific type. The nearest affinity of the plant is with *C. spongiosum*, a species much more densely branched and bushy, of a browner colour, with a very robust stem and very short articulations; but, like the present, remarkable for dichotomous, level-topped ramuli, and tetraspores placed opposite the alternate forkings.

272. **spongiosum** (*The spongy Callithamnion*); stems robust, cartilaginous, more or less opaque and veiny, branched in every direction; branches thickly set with dense, quadrifarious, repeatedly dichotomous, round-topped branchlets; axils patent; apices short, bifid; articulations of the branches swollen at the joints, twice or thrice as long as broad, *Harv. in Hook. Br. Fl. v.* 2. *p.* 346. (Atlas, Pl. LVII. Fig. 265.)
Hab. On perpendicular submarine rocks, near low-water mark, and parasitically on other Algæ. Annual. Summer.

Callithamnion spongiosum has much the external appearance of *C. arbuscula;* but its microscopic characters are so different, that they belong to separate sections of the genus. It is much more nearly allied to *C. corymbosum* or the exotic *C. granulatum*, a south of Europe species, which has so much in common with it that I shall not be surprised if future observations lead to their being united. From *C. corymbosum*, the duller colour, shorter joints, more robust and opaque stems, and dense, spongy habit, sufficiently distinguish it. It is curious that it appears to occupy the place of *C. arbuscula* on shores where the latter is not found, these plants never growing together, though both affect similar situations on different shores.

273. **pedicellatum** (*The pedicellate Callithamnion*); stems setaceous, pellucid, jointed, loosely and irregularly divided; branches furnished with short, alternate, sparingly dichotomous, ramuli; apices very obtuse; articulations variable, mostly very long; tetraspores (?) solitary, elliptical or pear-shaped, axillary, stalked, *Ag. Sp. Alg. v.* 2. *p.* 174. (Atlas, Pl. LX. Fig. 283.)
Callithamnion clavatum, *Ag.* C. Perreymondii, *Duby.* C. botryticum, *De Not.* Griffithsia irregularis, *Ktz.* Ceramium pedicellatum, *Ag.* C. clavægerum, *Bonn.* Conferva pedicellata, *E. Bot.*

Hab. On rocks and woodwork, near low-water mark, mostly in deep rock-pools; sometimes dredged in from 4–7 fathoms. Rather rare, but found all round the coast. Annual. Summer.

This plant is common on the shores of France, and in the Mediterranean, where its different varieties, as I regard them, are ennobled to the rank of species by most Continental botanists. Among the many forms which this plant puts on, I possess one gathered by Mr. Ralfs at Salcombe, which is remarkable for extremely squarrose ramuli and spreading branches.

274. **Rothii** (*Roth's Callithamnion*); widely spreading, densely tufted; filaments very slender, short, erect, dichotomous or irregularly branched; branches long, straight, appressed; articulations twice as long as broad; tetraspores clustered, borne on short, subterminal, corymbose ramuli, *Lyngb. Hyd. Dan. p.* 129. *t.* 41. (Atlas, Pl. LX. Fig. 278.)

Ceramium Rothii, *Berk.* Trentepohlia Rothii, *Harv.* Conferva Rothii, *Linn.* C. violacea, *Roth.* Trentepohlia purpurea, *Ag.* Byssus purpurea, *E. Bot.* Conferva purpurea, *Dillw.*

Hab. Spreading over the surface of rocks, about half-tide level. Perennial. Winter.

A smaller and more slender plant than the following, with shorter joints, and well characterized by the difference in fructification. I have ventured, I trust not without sufficient warrant, to unite to *C. Rothii* the old *Conferva* or *Byssus purpurea*, which I have long regarded as a stunted form, whose characters depend on the situation in which it is found growing.

275. **floridulum** (*The gay Callithamnion*); tufts very dense, more or less globose, fastigiate; filaments slender, dichotomous or alternately branched, the branches few, very erect or appressed, long, simple, straight; articulations thrice as long as broad, cylindrical; tetraspores oval, borne on very short, erect pedicels, ranged in a secund manner along the upper branches, *Ag. Sp. Alg. v.* 2. *p.* 188. (Atlas, Pl. LIX. Fig. 277.)

Trentepohlia floridula, *Harv.* Conferva floridula, *Dillw.*

Hab. On sand-covered rocks, near low-water mark, at all seasons. Perennial? March and April.

An exceedingly abundant species on the west coast of Ireland, covering a large extent of rock with its hemispherical, densely-matted, and aggregated cushions. At the close of summer great quantities of these, which are

called *figs* by the country-people, are washed on shore and collected as manure, though inferior in strength to many other marine plants.

276. **mesocarpum** (*The middle-fruited Callithamnion*); stems rising from creeping filaments, erect, simple or sparingly branched; branches alternate, very erect, naked, or having a few, scattered, erect ramuli; articulations four or five times as long as broad; tetraspores elliptical, on long, simple or forked, lateral pedicels, *Carm. Alg. Appin. MSS.* (*Harv. in Hook. Brit. Fl. v.* 2. *p.* 348.) (Atlas, Pl. LX. Fig. 279.)

Hab. Appin. On rocks at the extremity of low-water mark.

This species comes so close to some states of *C. Turneri*, particularly to those varieties constituting *C. repens* of authors, that it may fairly be questioned whether *C. mesocarpum* should not be erased altogether from the list of species, and referred as a synonym to *C. Turneri*. Captain Carmichael's specimen is mixed with fronds of *C. Pluma*. This is curious, as both were found growing on bare rocks, and *C. Pluma* is well known to prefer the stems of *Laminariæ*.

277. **sparsum** (*The scattered Callithamnion*); parasitical, minute filaments tufted, scattered, and sparingly branched; branches spreading, unequal; articulations twice or thrice as long as broad; tetraspores "obovate, sessile, mostly axillary," *Harv. in Hook. Br. Fl. v.* 2. *p.* 348. (Atlas, Pl. LX. Fig. 280.)

Callithamnion floridulum, *Lyngb.* Trentepohlia sparsa, *Harv.*

Hab. On old stems of *Laminaria saccharina* and *Cladophora rupestris*.

A minute and little known, but perhaps not uncommon species, in many respects allied to *C. Daviesii*, and in some approaching *C. Rothii*, but differing from both in the very simple filaments and flexuous branches.

278. **Daviesii** (*Davies's Callithamnion*); rose-red, minute, tufted, much branched; branches curved, scattered, patent; ramuli of several cells, fascicled, or crowded toward the axils of the secondary branches; tetraspores pedicellate, borne on the axillary ramuli, *Lyngb. Hyd. Dan. p.* 129. *t.* 41. (Atlas, Pl. LX. Fig. 281.)

Trentepohlia Daviesii, *Harv.* Conferva Daviesii, *Dillw.*

Hab. Parasitical on *Ceramium rubrum* and other small Algæ, in pools between tide-marks. Annual. Summer and autumn.

This and the species which follows are beautiful microscopic objects, but particularly *C. virgatulum*, for I find

C. Daviesii very generally infested by parasites still more minute than itself, particularly in and about the axillary ramuli. I do not find it so generally fertile as *C. virgatulum;* the crowding of parasites, and collection of dirt about the ramuli, where the tetraspores are borne, probably destroying the fructification.

279. **virgatulum** (*The little twig Callithamnion*); rose-red, minute, tufted, much branched; branches long and straight, erecto-patent, alternate or secund; ramuli from every joint short, obtuse, mostly secund; articulations thrice as long as broad; tetraspores scattered along the branches, *Harv. in Hook. Br. Fl. v.* 2. *p.* 349. (Atlas, Pl. LX. Fig. 282.)

Callithamnion Daviesii, var., *Harv.*

Hab. Parasitical on *Ceramium rubrum*, in pools between tide-marks.

C. virgatulum and *C. Daviesii* appear to be very distinct one from the other, and easily recognized at a glance:—the former distinguished by the uniform production of short ramuli along all its branches, which thus have the appearance, under the microscope, of budding rods; the latter known by having a few longish ramuli crowded towards the axils of the branches, while the rest of the branch is bare. But in practice I find it by no means easy to distinguish these supposed species. There is no lack of specimens, which are thus clearly distinguishable; but then, on the other hand, there is no lack of intermediate forms.

Sub-class III. CHLOROSPERMEÆ.

Order 14. *SIPHONACEÆ.*

LXXXVIII. CODIUM.

280. **Bursa** (*The purse Codium*); frond spherical, hollow, *Ag. Sp. Alg. v.* 1. *p.* 457. (Atlas, Pl. LXI. Fig. 284.)

Spongodium Bursa, *Lamour.* Lamarckia Bursa, *Olivi.* Agardhia Bursa, *Cabrera.* Fucus Bursa, *Turn.* Alcyonium Bursa, *Linn.* Bursa marina, *C. Bauhin.*

Hab. On submarine rocks. Perennial. Summer. Very rare.

Not being so fortunate as to possess a British specimen of this very rare and curious plant, I have been forced to make the drawing for the plate in 'Phycologia Britannica' from some of a fine series which I owe to the kindness of M. Lenormand, who procured them at Granville, on the French coast, where *Codium Bursa* is common. The station on the Sussex coast, quoted from Pallas, is not prolific in modern times, nor have I ever seen any British specimen, except a small one obtained by Mrs. Griffiths, in Devonshire. No one has met with this plant near Belfast but Mr. Templeton, and I have not seen his specimens.

281. **adhærens** (*The adhering Codium*); frond forming a velvety crust on the surface of rocks, *Ag. Sp. Alg. v.* 1. *p.* 467. (Atlas, Pl. LXII. Fig. 288.)

Agardhia adhærens, *Cabrera.*

Hab. South of England. On marine rocks, near low-water mark. Perennial. Summer and winter. Rare.

I am indebted to Mr. Peach of Fowey for living specimens of this curious plant, which he finds in great perfection at Gorran Haven. It appears to be of slow growth; for Mr. Ralfs informs me, that patches cut out one year, are but partially filled up after twelve months. I am not quite certain that the Mauritius specimens, formerly described by me, are identical with the European.

282. **amphibium** (*The amphibious Codium*); fronds minute, erect, cylindrical, simple, obtuse, aggregated in widely spreading strata, *Moore et Harv. in Ann. Nat. Hist. v.* 13. *p.* 321. *pl.* 6. (Atlas, Pl. LXII. Fig. 289.)

Hab. West of Ireland. On turf-banks at extreme high-water mark.

Codium amphibium was discovered by Mr. M'Calla, in October 1843, spreading in patches of great extent along the edge of the sea, over the surface of a turf-bog which meets the shore at Roundstone Bay. In this situation the plant is exposed alternately to the influence of salt and of fresh water, and, it would appear, is even affected by atmospheric changes: for its discoverer has observed that "in dry weather it loses all its characters, the frond shrinking to *a mere nothing*, but on the return of moisture it immediately gets fresh again."

283. **tomentosum** (*The tomentose Codium*); frond linear, dichotomous, cylindrical or compressed, *Ag. Sp. Alg. v.* 1. *p.* 452. (Atlas, Pl. LXI. Fig. 285.)

Codium elongatum, *Ag.* C. lineare? *Ag.* C. filiforme? *Montg.* Spongodium tomentosum, *Lamour.* S. commune, *Bory.* Fucus tomentosus, *Huds.* Agardhia dichotoma, areolata, et ramentacea, *Cabrera.*

Hab. On rocks in the sea, within the range of the tide; generally near low-water mark. Perennial. Summer.

There are slight points of difference, on which authors have founded species, which I cannot but regard as mere varieties of a common type. Such is the *C. elongatum* of Agardh, a figure of which is given in the 'History of Algiers,' published under the auspices of the French Government. This *form*, which accompanies the common *C. tomentosum* on the west coast of Ireland, is chiefly remarkable for a great dilatation of the frond immediately under the forking of the branches. This enlargement however may be found in various degrees of development, connecting the most dissimilar-looking individuals of *C. elongatum*, with the common dichotomous, filiform *C. tomentosum*. Were *C. elongatum* admitted as a species, several other forms might be ennobled on grounds as valid. *C. tomentosum* has to the naked eye quite the appearance, though not the substance or structure, of a sponge; and indeed very closely resembles in form and colour the *Spongia hispida*, Mont., offering a beautiful instance of *analogy* between organisms whose *affinity* is widely separated. It occurs throughout the Pacific Ocean, from the shores of Arctic America and Asia to the southern extremity of America; and is equally dispersed throughout the Atlantic.

LXXXIX. BRYOPSIS.

284. **plumosa** (*The feathery Bryopsis*); frond having a triangular outline, naked below, branched above, branches spreading, their upper half pectinato-pinnated, pinnules subdistichous, *Ag. Sp. Alg. v.* 1. *p.* 448. (Atlas, Pl. LXI. Fig. 286.)
Bryopsis Lyngbyæi, *Fl. Dan.* Ulva plumosa, *Huds.*
Hab. In the sea, on rocks and small stones. Annual. Summer and autumn.

Though having all the softness of texture and brilliant green colouring of the *Confervæ*, the *Bryopsides* must be regarded as holding a still lower rank in the Vegetable Kingdom, and approaching very nearly to those organisms that seem uncertain under which banner to arrange themselves, whether animal or vegetable. Viewed by itself, indeed, *Bryopsis plumosa* appears as perfect a vegetable as any, but taken in connection with neighbouring nearly allied structures, *Dasycladus, Caulerpa, Polyphysa, Halimeda, Struvea*, etc., it is found to approach much more closely to the confines than would at first sight be supposed. It is a very widely distributed plant, found plentifully throughout both the temperate zones, and even in some of the warmer seas.

285. **hypnoides** (*The Hypnum-like Bryopsis*); frond slender, very much branched; branches long, repeatedly compound, densely clothed with capillary, elongate ramuli ramellose towards their tips; ultimate ramelli irregularly inserted, erect, *Lam. Journ. Bot.* 1809. *p.* 135. *t.* 1. *f.* 2. (Atlas, Pl. LXI. Fig. 287.)
Bryopsis Arbuscula, *Ag.*
Hab. On rocks, or parasitical on the smaller *Algæ* in submarine tide-pools, in shaded situations; also on *Laminaria saccharina* beyond tide-marks. Annual. Summer. Particularly abundant in parts of the west of Ireland.

This is a more slender plant than *B. plumosa*, and much more branched; with more abundant, less regular, and longer ramuli; but specimens sometimes occur which show a very close connection between them. On the west of Ireland *B. hypnoides* is the most abundant, and reaches a size much greater than it attains on the English coast. In sheltered bays, where the broad-leaved variety of *Laminaria saccharina* delights to grow, that plant is often seen covered with thick bunches of this *Bryopsis*, of an extra-

ordinary size and luxuriance. These are never exposed at low water, and can only be reached in a boat; but in shady channels and pools between tide-marks, even at some distance above the low-water limit, specimens of nearly equal size, attached to smaller Algæ, are frequently met with.

XC. VAUCHERIA.

286. **submarina** (*The submarine Vaucheria*); "forked fastigiate threads; coniocystæ (sporangia) numerous, lanceolate and ovate, confined to the upper branches," *Berk. Gl. Br. Alg. p.* 24. *t.* 8. (Atlas, Pl. LXII. Fig. 291.)

Vaucheria dichotoma, var., *Ag.*

Hab. On the muddy sea-shore.

I am only acquainted with this species through Mr. Berkeley's description and figure, both of which I have in 'Phycologia Britannica,' with his permission, made use of.

287. **marina** (*The marine Vaucheria*); filaments loosely tufted, or distinct; branches few, very long, obtuse; sporangia solitary, obovate, pedicellate, lateral, *Lyngb. Hyd. Dan. p.* 79. *t.* 22. (Atlas, Pl. LXII. Fig. 290.)

Hab. On sea-plants, mud, etc., between tide-marks. Annual. Summer.

Not being able to prepare a satisfactory figure of this plant from dried specimens, and not having access to recent ones, the figure in 'Phycologia Britannica' is copied from the work of Lyngbye.

288. **velutina** (*The velvety Vaucheria*); filaments creeping; branches erect, fastigiate, woven into a velvety stratum; sporangia solitary, globose, lateral, on short stalks, *Ag. Syst. p.* 312. (Atlas, Pl. LXII. Fig. 292.)

Hab. On the muddy sea-shore, and on mud-covered rocks, between tide-marks, generally above half-tide level. Annual. Spring and summer.

When properly developed, as on flat, muddy shores, the velvety stratum of this plant frequently carpets the mud with its intense green coating, over a very large extent of surface. The filaments of which the mass consists are inextricably and most closely woven together. To the naked eye *V. velutina* bears a close resemblance to the freshwater *V. cæspitosa*, but is less cushioned, and the upright branches forming the pile are shorter.

ORDER 15. *CONFERVACEÆ.*

XCI. CLADOPHORA.

289. **Brownii** (*Brown's Cladophora*); filaments forming dense, cushion-like tufts, erect, rigid, flexuous, elastic, slightly branched; branches few, long, sub-simple, secund; axils acute; articulations four or five times longer than broad, the lower ones thickened upwards, the upper cylindrical, *Harv. Phy. Brit. pl.* 30. (ATLAS, Pl. LXII. Fig. 293.)

Cladophora glomerata, var., *Hass.* Conferva Brownii, *Dillw.* C. pulvinata, *R. Br.*

Hab. In maritime situations exposed to the alternate influence of salt and fresh water; rare. Perennial.

Perhaps I transgress the true limits of a work on *marine* Algæ by including in it a plant which belongs as much to the land as to the sea, and which is only occasionally wet with sea-water. The habit of *Cladophora Brownii* is that of *Vaucheria terrestris;* a habit admirably expressed in Mr. Brown's MS. name "*pulvinata.*" It appears to be peculiar to the British Islands.

290. **repens** (*The matted Cladophora*); forming dense, cushion-shaped or globular tufts; filaments short, capillary, rigid, densely matted together, rising from root-like fibres; slightly branched; branches erect, subsimple or forked, naked, or with a few distant, secund ramuli; articulations cylindrical, very long (ten to twenty times as long as their diameter, *Harv. Phyc. Brit. pl.* 236. (ATLAS, Pl. LXVI. Fig. 306.)

Conferva repens, *J. Ag.* Œgagropila simplex, *Lenorm.*

Hab. Jersey. Thrown on shore after a gale. Annual? Summer.

Picked up by Miss Turner, on the beach at Jersey, after a heavy gale, in 1846; four tufts only were found, and the plant has not since been noticed. Though not one of the handsomest, this is one of the most curious species of the genus. Outwardly it nearly resembles *C. Brownii*, but the form and proportion of the articulations are very different.

291. **pellucida** (*The transparent Cladophora*); filaments rigid, erect, setaceous, full dark-green, di-trichomotous; the axils very acute, the branches erect; articulations many times longer than broad; dissepiments only at the forking of the branches and ramuli, *Ktz. Phyc. Gen. p.* 271. (ATLAS, Pl. LXIII. Fig. 294.)

Conferva pellucida, *Huds.*

Hab. On the bottoms and sides of deep rock-pools, between tide-

marks, generally near low-water mark; not left dry at low water. Annual? Summer.

It is pleasant in such a genus as *Cladophora*, where the species often seem to run insensibly into one another, to find one so broadly distinguished from the rest that there can be no mistake about it. The plant here described is just of this character. *Cladophora pellucida* may at once be known by its very distinct di-trichotomous branching, and by there being but a single articulation or *cell* in the space intervening between each furcation; that is to say, every *internode* consists of a single cell. There is no other British species in which this takes place regularly, in all parts of the frond. It thus happens that the individual *cells*, in this species, are of extraordinary length, those of the lower parts of the filament being sometimes more than an inch in length, very frequently three-quarters of an inch.

292. **rectangularis** (*The rectangular Cladophora*); filaments setaceous, rigid, forming intricate tufts; branches opposite, distant, elongated, patent, furnished throughout with short, opposite, horizontal ramuli; articulations twice or thrice as long as broad, *Harv. Phyc. Brit. pl.* 12. (Atlas, Pl. LXIII. Fig. 295.)

Conferva rectangularis, *Griff.*

Hab. South of England; very rare. In the sea, at depths beyond the influence of the tides. Annual. Summer.

A beautiful species, discovered in the year 1832 by Mr. Borrer, washed up on the beach at Torquay, and occasionally found, but very rarely, in the same locality by Mrs. Griffiths and Mrs. Wyatt. No species can be more distinct. The very patent, opposite branches, and the invariably opposite, distichous, horizontal ramuli are its peculiar characteristics. It is most nearly related to *C. Hutchinsiæ* and *C. diffusa*, of which it has the size, rigidity, and something of the habit. But the opposite ramuli clearly separate it from either.

293. **Macallana** (*M'Calla's Cladophora*); filaments setaceous, rigid, full green, very flexuous, loosely bundled together, excessively branched; branches alternate or rarely opposite, zigzag, very patent; ramuli short, recurved, simple or pectinated, obtuse; articulations twice or thrice as long as broad; endochrome rather dense, *Harv. Phyc. Brit. pl.* 84. (Atlas, Pl. LXIII. Fig. 296.)

Hab. West of Ireland. On the sandy bottom of the sea, in 4–10 fathoms water. Annual. Summer.

This handsome *Cladophora*, when growing, has very much the appearance, at first sight, of *C. rectangularis*, so much so indeed, that until the ramification be closely looked to, and the *alternate* or *secund* ramuli be observed, it might be mistaken for that species. It grows in the same locality, and occurs in similar loosely-bundled masses, and often accompanies *C. rectangularis* in the same dredge. It possesses the same rigid substance as that species, and the same glossy, bright green colour, except when it is infested with *Cocconeis aggregata*, which not only change its colour but prevent its adhering to paper.

294. **Hutchinsiæ** (*Miss Hutchins's Cladophora*); filaments setaceous, of equal diameter throughout, rigid, crisp, glaucous-green, flexuous, tufted, bristling; ramuli erecto-patent, simple or furnished along the inner face with short processes of one or two articulations; apices very obtuse; articulations twice or thrice as long as broad, the joints contracted, *Harv. in Hook. Br. Fl. v. 2. p.* 357. (Atlas, Pl. LXIII. Fig. 297.)

Conferva Hutchinsiæ, *Dillw.*

Hab. On the rocky bottoms of clear tide-pools, near low-water mark. Annual. Summer. Rather rare.

A very beautiful and strong-growing species, discovered about the year 1808, by the late Miss Hutchins, of Ballylicky, near Bantry. It is very closely allied to *C. diffusa*; but the filaments are of greater diameter, the ramuli more abundant and shorter, and the joints shorter and generally contracted at the dissepiments.

295. **diffusa** (*The diffused Cladophora*); filaments sub-setaceous, loosely tufted, rigid, dark or full green, flexuous, much branched; branches distant, elongated, irregularly subdivided, or somewhat dichotomous, furnished towards the top with a few secund, simple ramuli; articulations 3–4 times longer than broad, *Roth, Cat. Bot. v. 2. p.* 207. *t.* 7. (Atlas, Pl. LXIV. Fig. 298.)

Conferva diffusa, *Roth.* C. distans, *Ag.*

Hab. On rocks and stones between tide-marks, and in clear pools near low-water mark. Annual. Summer.

The *Conferva diffusa* of British authors is perhaps scarcely sufficiently distinct from *Cladophora Hutchinsiæ*. It is more slender than the typical form of that species, its branches are less frequently divided, the ramuli longer,

more distant and simple, the joints longer, and the substance less firm and rigid. Still specimens frequently occur which seem to connect the two.

296. **nuda** (*The naked Cladophora*); filaments somewhat rigid, slender, very straight, dull-green or olivaceous (when dry), sparingly dichotomous; ramuli few and scattered, appressed. the uppermost often opposite; articulations many times longer than broad, *Harv. Man. ed.* 2. *p.* 101. (ATLAS, Pl. LXVI. Fig. 307.)

Conferva nuda, *Harv.*

Hab. On basalt rocks, between tide-marks.

My knowledge of this species, if the plant be entitled to rank as a species, is confined to a specimen collected by Mr. Moore, many years ago, on the coast of Antrim, and now preserved in the Dublin University Herbarium. It is undoubtedly nearly related to *C. rupestris*, from which, at first sight, it differs by its duller colour and more naked branches, and especially by the much longer articulations of the stem, and the wider borders of the tube. Still, I fear this character of long joints, which is the strongest of those mentioned, is not to be altogether counted on; for though I have not observed the joints in any specimen of *C. rupestris* to be of the extreme length of those of *C. nuda*, yet I have seen a tendency in some specimens of that species to produce long joints; and this, joined to the non-occurrence in recent times of *C. nuda*, has latterly disposed me to consider it a variety of *C. rupestris*.

297. **rupestris** (*The rock-inhabiting Cladophora*); filaments capillary, rigid, dark-green, straight, tufted, bushy; branches erect, crowded, densely clothed with appressed, opposite or tufted, subulate ramuli; articulations three or four times longer than broad, *Ktz. Phy. Gen. p.* 270. (ATLAS, Pl. LXIV. Fig. 299.)

Conferva rupestris, *Linn.* C. glauca, *Roth.* C. virgata, *Roth.*

Hab. On rocks in the sea, between tide-marks; also beyond the limits of low water. Annual. Summer and autumn.

A very beautiful plant, when well grown, common on all our rocky shores, and extending through the whole of the littoral zone, even into the belt of the *Laminariæ*. Specimens gradually increase in luxuriance, and in the purity and depth of their colour, as their habitat is remote from high water; and those which are collected in deep rock-basins, at the verge of the tide, are remarkably handsome.

So common a plant could not escape notice from the earliest time, and consequently we find it mentioned both in Theophrastus and Dioscorides. A characteristic figure, for the age, is given by Dillenius; and it received its present name in the 'Species Plantarum' of Linnæus.

298. **lætevirens** (*The pale-green Cladophora*); filaments much branched, bushy, forming tufts of a transparent, yellow-green colour, faded, and without gloss when dry; branches erecto-patent, crowded, repeatedly divided, flexuous, the lesser divisions often opposite; ultimate ramuli secund, blunt, of few articulations; articulations of the branches six times, of the ramuli thrice, as long as broad, *Ktz. Phyc. Gen. p.* 267. (Atlas, Pl. LXIV. Fig. 300.)

Cladophora Ægæa, *Ktz.* Conferva lætevirens, *Dillw.* C. glomerata, var., *Roth.*

Hab. On rocks, stones, and Algæ, between tide-marks. Annual. Summer.

First proposed as a distinct species by Dillwyn, who draws attention to its peculiarly pale green colour and bushy mode of growth. These characters, taken in addition to the robust threads, spreading branches, and blunt ramuli, may serve to distinguish it from our other marine kinds, but it is more difficult to point out characters by which it may be known from a fresh-water species, *C. glomerata*. Among such imperfect plants, however, *habitat* may, perhaps, be admitted as a character of no ordinary importance, and if we allow it in the present case, there can be no difficulty in the matter; for *C. lætevirens* is found in the open sea, beyond all influence of fresh-water, and *C. glomerata* in rills and rivers remote from the sea.

299. **flexuosa** (*The flexuous Cladophora*); filaments capillary, flexuous or angularly bent, pale-green, much branched, the branches of unequal length and (comparatively) but little divided, set with curved secondary or tertiary branches, which are pectinated with secund, short, simple, spreading ramuli; articulations of the branches thrice or four times, of the ramuli twice as long as broad, *Griff., in Wyatt, Alg. Damn. no.* 227. (Atlas, Pl. LXIV. Fig. 301.)

Cladophora sirocladia, var., *Ktz.*

Hab. In rock-pools, between tide-marks, attached to other Algæ.

Not being in possession of any authentic specimen of the *Conferva flexuosa* of Dillwyn, on which the present species is supposed to be founded, and also having good reason

to doubt the identity of the plant with that figured by Dillwyn, I think it best to abstain from quoting any synonym for habitat which I have not recently verified. My description therefore has reference alone to the specimens published by Mrs. Griffiths in Wyatt's 'Algæ Damnonienses,' and to such as agree with them in character.

300. **gracilis** (*The slender Cladophora*); filaments very long, capillary, flexuous, silky, much branched, bright yellow-green; main branches entangled, sparingly divided, angularly bent; ultimate ramuli pectinate, secund, much attenuated, straight and very long; articulations 3–5 times longer than broad, *Harv. Phy. Brit. pl.* 18. (Atlas, Pl. LXV. Fig. 302.)

Conferva gracilis, *Griff.*

Hab. Growing on *Zostera* and the larger Algæ, in 4–5 fathoms. Annual. Summer.

As far as British species are concerned the student will find little difficulty in recognizing this plant; the only ones with which it can be confounded are *C. flexuosa*, than which it is much more luxuriant, more glossy, and more branching; and *C. Kaneana*, M'Calla, which is softer, more flaccid, and much more slender and delicate. But the exotic species of this puzzling genus have not been sufficiently compared together to judge to which of them it most nearly approaches, or whether it may not be identical with some European form which passes under a different name. I have sometimes feared that it should be referred to *C. sericea* of Roth.

301. **Balliana** (*Miss Ball's Cladophora*); filaments elongate, extremely slender, soft, grass-green, much branched; the branches excessively divided, the penultimate ones virgate, and set with slender, secund, one- or two-jointed ramuli; articulations of the branches eight or ten times as long as broad, of the ramuli six to eight times, all filled with dense, granular endochrome; dissepiments broad and hyaline, *Harv. Phy. Brit. pl.* 356. (Atlas, Pl. LXV. Fig. 303.)

Hab. Sea-shores.

Cladophora Balliana is readily known from all its British congeners but one, by the tenuity and lubricity of the filament, in conjunction with the great length of the cells. The only species with which it can be confounded is *C. Rudolphiana*, but the ramification is so different in that plant, that, notwithstanding a near agreement in the length of the articulations and the general aspect of the tufts,

there can be little difficulty in distinguishing one from the other.

302. **Rudolphiana** (*Rudolphi's Cladophora*); filaments very long, exceedingly slender, flexuous, subgelatinoso-membranaceous, much branched, brilliant yellow-green, inextricable; branches di-trichotomous or irregular; ultimate ramuli pectinate, secund, very long and much attenuated; articulations of the main filaments many times longer than broad, here and there swollen, their granular endochrome somewhat spiral; those of the ramuli 6–10 times as long as broad, *Ktz. Phyc. Gen. p.* 268. (Atlas, Pl. LXV. Fig. 304.)

Conferva Rudolphiana, *Ag.* C. Kaneana, *M'Calla.*

Hab. Parasitical on *Zostera*, the various *Laminariæ*, and other sea-plants, in 2–6 fathoms water. Annual. Summer.

One of the commonest sea-plants in Roundstone Bay, Cunnemara, where it infests every object on which it can lay hold, at a depth of from two to six fathoms, or perhaps more. Whilst young, and freely waving in the water, it is a very beautiful object; but in age its tufts become drawn out to a great length, and its filaments twisted into green, mucous ropes, which stick to any object which comes near them. The botanist who dredges where this plant grows, however much he may admire it on the first few hauls, will soon wish that it was not quite so affectionate. Among British species, the nearest affinity of *C. Rudolphiana* is with *C. gracilis*, with which it agrees in the ramification, and in the great length of the alternate ramuli. But its filaments are very much more slender, its substance softer and more flaccid, and its joints very much longer. The *great* length of the joints will also distinguish it from *C. albida*, which it likewise resembles.

303. **refracta** (*The reflexed Cladophora*); filaments capillary, somewhat rigid, tufted, bright-green, very much branched; secondary branches spreading on all sides, repeatedly divided, thickly clothed with very much spreading or reflexed, short branchlets, which are pectinated with ramuli on their upper surface; articulations twice or thrice as long as broad, *Ktz. Phyc. Gen. p.* 267. (Atlas, Pl. LXV. Fig. 305.)

Conferva refracta, *Roth.*

Hab. In rocky pools, left by the tide, near low-water mark. Annual. Summer.

C. refracta most nearly agrees in character with *C. albida*, but the filaments are coarser, and far more rigid, standing out from each other when the tuft is removed

from the water; the colour is a brighter and fuller green; the ultimate branches are shorter and more patent, often strongly reflexed, and the general habit is by no means spongy. It appears to prefer the clearest and purest water, growing on the bare rock, or among Corallines, in deep cold pools left by the tide, near the extreme of low-water mark. Where I have seen it, both at Kilkee and Dingle, it could only be reached at spring-tides.

304. **albida** (*The whitish Cladophora*); filaments exceedingly slender, flaccid, pale yellow-green (whitish when dry), forming dense, silky or somewhat spongy, soft, intricate tufts; branches crowded, irregular, the uppermost patent and mostly opposite; ramuli opposite or secund; articulations four or five times as long as broad, *Ktz. Phyc. Un. p.* 267. (Atlas, Pl. LXIX. Fig. 324.)

Conferva albida, *Huds.*

Hab. Southern shores of England and Ireland. On rocks and Algæ, between tide-marks, usually near low-water mark. Annual. Summer.

A handsome species, and one of the earliest recognized, distinguished from most of our common kinds by the tenuity and softness of the filaments, their length, and the uniformly short articulations. It is most nearly related to *C. refracta*, with which Agardh unites it, but is a taller plant, with less patent and less compound ramification, a softer substance, a paler colour, and altogether a different aspect.

305. **lanosa** (*The woolly Cladophora*); filaments slender, short, yellow-green, forming dense globular tufts; branches virgate, erect, subdistant, straight, alternate or rarely opposite; ramuli few, alternate or secund; axils very acute; lower joints twice, upper six times as long as broad, *Kütz. Phyc. Gen. p.* 269. (Atlas, Pl. LXVI. Fig. 308.)

Conferva lanosa, *Roth.*

Hab. In the sea, on rocks, or, more frequently, on the larger *Fuci*.

This plant is found in abundance on most of the Atlantic shores of Europe, inhabiting the old stems of *Fucus serratus* and *F. vesiculosus*, the leaves of *Zostera marina*, and occasionally, but far less frequently, growing on submarine rocks and stones. It is decidedly found in greater perfection and abundance as we proceed northwards, and on the west coast of Scotland the finest specimens we have seen are gathered.

306. **uncialis** (*The inch Cladophora*); tufts very short, spongy, simple below, above divided into numerous fastigiate, woolly segments; filaments flexuous, sparingly branched, densely interwoven; ramuli distant, secund, long, patent or incurved; articulations about twice as long as broad, *Harv. Phy. Brit. pl.* 207. (Atlas, Pl. LXVI. Fig. 309.)

Spongiomorpha uncialis, *Ktz.* Conferva uncialis, *Fl. Dan.*

Hab. On rocks, near low-water mark. Annual. May.

This plant more nearly resembles *C. lanosa* than any other of our native species, and sometimes cannot be readily distinguished without a close examination; but it forms much more dense and spongy tufts, which finally become more intricately interwoven together, and the apices are seldom so distinctly fastigiate as in that species. The habitat in which *C. uncialis* occurs affords an additional clue. It usually frequents rocky places, growing on the rock itself, or among the thin coating of sand which covers it, in places close to the edge of low-water mark. *C. lanosa*, on the contrary, is almost always found as a parasite on other Algæ, or else attached to pieces of wood and to the leaves of *Zostera*. To *C. arcta* our *C. uncialis* has much resemblance, but is a much smaller plant, with very much more slender filaments.

307. **arcta** (*The straight Cladophora*); filaments forming broad, starry tufts, of a brilliant green colour, much branched, and more or less matted together below; branches straight, crowded, very erect; ramuli appressed, opposite or alternate, scattered; articulations in the older parts once or twice as long as broad, in the young (upper) branches many times longer, *Ktz. Phyc. Gen. p.* 263. (Atlas, Pl. LXVI. Fig. 310.)

Cladophora vaucheriæformis, *Ktz.* C. centralis, *Ktz.* Conferva arcta, *Dillw.* C. centralis, *Lyngb.* C. vaucheriæformis, *Ag.*

Hab. On exposed submarine rocks from half-tide level to low-water mark. Perennial? Spring, summer, and autumn.

This species has a very different aspect at different periods of its growth, and it is not without a careful examination, and watching the plant as it progresses from its infant state till it reaches maturity, and gradually passes off into old-age and decay, that it can be fully understood. I believe that it always grows upon rocks, within the range of the tide, but nearly at the limit of low-water, and in such places it frequently covers a considerable surface. When young, its colour is peculiarly vivid, and its aspect

silky; but as it progresses, the bright colour is more and more confined to the top branches, and the lower part of the frond becomes coarse and woolly.

308. **glaucescens** (*The glaucous Cladophora*); tufts dense, glaucous-green, subfastigiate; filaments very slender, flexuous, excessively branched; branches rather straight, erect or erecto-patent, the lesser ones furnished with close, very erect, straight, elongated ramuli; articulations nearly uniform, about thrice as long as broad, *Harv. Phy. Br. pl.* 196. (ATLAS, Pl. LXVI. Fig. 311.)

Conferva glaucescens, *Griff.*

Hab. On rocks and stones, between tide-marks. Annual. Summer.

It is difficult to say to which of the British species of *Cladophora* this species is most closely allied. At one time I regarded it as belonging to the same group as *C. arcta*, and even thought that it might prove to be merely a state of that species; but a more careful examination and comparison show a greater affinity with *C. albida* or *C. refracta*, from either of which however it is readily known by a difference in ramification. Its glaucous colour when fresh, the slenderness of the filaments, and the uniform length of the articulations in all parts of the stem, are characters by which it may most easily be known.

309. **falcata** (*The hooked Cladophora*); densely tufted, dark-green; filaments intricate at the base, ultra-capillary, rigid, much curved, irregularly branched; branches zigzag, repeatedly divided, the lesser divisions arched, or strongly incurved and falcate, furnished along their inner faces with short, secund, blunt ramuli; articulations three or four times longer than broad, with a dense endochrome and pellucid dissepiments, *Harv. Phyc. Brit. pl.* 216. (ATLAS, Pl. LXIX. Fig. 325.)

Hab. The bottoms of clear rock-pools, near low-water mark. Annual. Summer.

I gathered a few specimens of the *Cladophora* here described in the summer of 1845, in some deep rock-pools, near low-water mark, under a steep mural cliff outside Dingle Harbour, Kerry, in a situation where the fronds were constantly in shade. More recently I have received from Miss White specimens collected at Jersey, which agree in most characters with the west-of-Ireland plant, but are not exactly true to the type. Beautiful, and appa-

rently distinct, as our *C. falcata* is, I am by no means satisfied that it should be regarded as a true species; for, omitting the curled branches and the bending of the ramuli to one side, there are little or no characters to keep it separate from *C. lætevirens*.

310. **Magdelenæ** (*Miss Turner's Cladophora*); filaments capillary, blackish-green, short, decumbent (?), matted together, slightly branched, irregularly bent; branches patent or divaricate, curved, dichotomous or secund, with wide axils; ramuli few, spreading, falcate, as thick as the cells from which they spring; articulations thrice or four times as long as broad, filled with very dense opaque endochrome; dissepiments very narrow, not contracted, *Harv. Phy. Brit. pl.* 355, *A.* (Atlas, Pl. LXVII. Fig. 312.)

Hab. Jersey.

Unlike as this little plant (discovered in Jersey by Miss Magdelene Turner) is in ramification and general aspect to *C. rupestris*, the cells, under the microscope, strongly resemble those of that species; yet I can hardly think it next of kin to that straight-growing plant, and perhaps *C. fracta* is more nearly related.

311. **Gattyæ** (*Mrs. Gatty's Cladophora*); filaments an inch long, dingy-green, capillary, matted together in dense tufts, not much branched, dichotomously divided, flexuous, with few ramuli; articulations in all parts of the frond nearly uniform, about once and half as long as broad, filled with endochrome; the dissepiments very narrow, contracted, *Harv. Phy. Brit. pl.* 355, *B.* (Atlas, Pl. LXVII. Fig. 313.)

Hab. On rocks (?), near low-water mark. Locality uncertain.

The external habit is between that of *C. uncialis* and *Ectocarpus littoralis*, but the threads are very much more robust than in the former, and differently branched from the latter, as well as more robust. The plant is, however, much battered and water-worn, having most of its upper branches and ramuli broken off; and I am not prepared to say whether it be not some species in a dilapidated condition, whose proper character may be concealed.

312. **flavescens** (*The yellowish Cladophora*); forming pale yellowish strata; filaments slender, sparingly branched; branches alternate or subdichotomous, erecto-patent, with scattered, elongate, alternate or secund ramuli; articulations from eight to nine times as long as broad, *Kutz. Phyc. Gen. p.* 267. (Atlas, Pl. LXVII. Fig. 314.)

This species frequently fills the pools in which it grows, and, rising in the water, covers the surface with a thick fleece, under which large bubbles of air (a portion of which is oxygen disengaged by the plant under the influence of light) are confined. It is readily distinguished from *C. fracta* by its paler green colour, as well as by the much longer articulations, and their less granular contents.

313. **fracta** (*The broken Cladophora*); tufts irregular, entangled, often detached and then forming floating strata, dull-green; filaments somewhat rigid, distantly branched, the lesser branches somewhat dichotomous, spreading, with very wide axils, the ramuli few, alternate or commonly secund; articulations from three to six times as long as broad, at first cylindrical, then elliptical, with contracted dissepiments, *Ktz. Phyc. Gen. p.* 263. (Atlas, Pl. LXVII. Fig. 315.)

Conferva fracta, *Fl. Dan.* C. divaricata, *Roth.* C. vagabunda, *Huds.* C. hirta, *Fl. Dan.* C. flavescens, *Wyatt.*

Hab. In ditches of brackish water, communicating with the tide; also in fresh-water lakes, ditches, and streams. Common.

The occasional occurrence of this species in salt-water ditches near the coast gives it a claim to be admitted into the present work. *C. fracta* is rarely found attached; it is more commonly met with heaped together in widely extending strata, covering the surface of the water. Sometimes in lakes, as it thus floats about, it becomes rolled together in dense balls, which have a good deal of the aspect of *C. ægagropila*, but not the same regularly radiant structure. When fully developed and in mature fruit, the middle portion of the frond is very frequently entirely converted into a string of *sporangia*, and is then a beautiful and characteristic microscopic object, which it is impossible to mistake for anything else. When not in fruit, *C. fracta* is more easily known from *C. flavescens* by the shorter articulations than by any other character.

XCII. RHIZOCLONIUM.

314. **riparium** (*The shore Rhizoclonium*); filaments long, slender, decumbent, pale-green, forming wide strata, flaccid, entangled, angularly bent, furnished at the angles with short, root-like processes (which sometimes, but rarely, lengthen into very patent branches, and often attach themselves to neighbouring filaments), *Harv. Phy. Brit. pl.* 238. (Atlas, Pl. LXVII. Fig. 316.)

Rhizoclonium obtusangulum, *Ktz.* Conferva riparia, *Roth.* C. obtusangula, *Lyngb.* C. perreptans, *Carm.* C. tortuosa, *Wyatt.* Zygnema littoreum, *Lyngb.*

Hab. On sand-covered rocks, near high-water mark. Annual. Summer. Not common.

The specimens published by Mrs. Wyatt, under the name *Conferva tortuosa*, belong, in the copies of her valuable work which I have examined, to our *R. riparium*. It is more slender than *C. tortuosa*, of a paler colour, and, above all, distinguished by the root-like fibres which issue at intervals from the articulations, and the presence of which has induced Kützing to place it in a separate genus.

315. **Casparyi** (*Caspary's Rhizoclonium*); filaments elongated, extremely slender, decumbent, pale yellow-green, stratified, interwoven, curved, and here and there angularly bent; at the angles emitting short root-like branches, which sometimes lengthen, and are filled with endochrome; articulations 2–6 times longer than broad, with narrow dissepiments and granular endochrome, *Harv. Phyc. Brit. pl.* 354, *B.* (Atlas, Pl. LXVIII. Fig. 318.)

Hab. Falmouth and Penzance.

This species has more slender filaments than the ordinary *R. riparium*, and occasionally appears with longer joints. But the joints vary extremely in different threads, and even in the same thread, so that I find it difficult to fix any satisfactory character by which it can be known from *R. riparium*, in the absence of specimens of that plant.

XCIII. CONFERVA.

316. **arenicola** (*The sand-inhabiting Conferva*); "threads soft, simple, extremely fine, matted, somewhat crisped, at first uniform pale-green, at length distinctly jointed; articulations once and half as long as broad, dotted; interstices pellucid," *Berk. Gl. Brit. Alg. p.* 36. *t.* 13. *f.* 3. (Atlas, Pl. LXVII. Fig. 317.)

Hab. Salt-marshes, within reach of the tide.

I am indebted to Mr. Berkeley, from whose 'Gleanings' I copy the above account, for a loan of the original specimen from which his description was prepared. Except in colour, this plant bears a close resemblance to *C. implexa*.

317. **arenosa** (*The sandy Conferva*); filament slender, straightish, rigid, forming broad strata; articulations from three to five times longer than broad, *Carm. Alg. Appin.* (Atlas, Pl. LXVIII. Fig. 321.)

Hab. On the sandy sea-shore, at half-tide level.

The great length of the joints readily distinguishes this species from any other British marine *Conferva*.

318. **litorea** (*The shore Conferva*); filaments thick, rigid, crisped, forming loose, extensive bundles of a dull-green colour; articulations once and half as long as broad, here and there swollen in pairs and discoloured, *Harv. Man. ed.* 2. *p.* 208. (Atlas, Pl. LXVIII. Fig. 322.)

Conferva Linum, *Harv.*

Hab. In salt-water ditches near the coast; in estuaries, and along the muddy sea-shore, between tide-marks. Annual. Summer.

This is the plant commonly found in British herbaria under the name *C. Linum*, Br. Fl., but which is very different from the plant so named by Roth, and has indeed more in common with *C. tortuosa*, Dillw. Not having been able to identify our British specimens with any Continental species, I have been forced to bestow a new name on them.

319. **Linum** (*The pack-thread Conferva*); filaments very thick, of great length, light or dark green according to age, much curled, rigid, forming loosely entangled, harsh strata; articulations as long as broad, *Roth, Cat. Bot. v.* 1. *p.* 174, *and v.* 3. *p.* 257. (Atlas, Pl. LXVIII. Fig. 323.)

Conferva capillaris, *Huds.* C. crassa, *Ag.*

Hab. In salt-water ditches, near the coast.

The plant now figured is what, in British works, is usually called *C. crassa*. On placing together under the microscope specimens from several localities, there may be observed minor differences between them, but all have so many characters in common, that I consider it quite inexpedient to propose more than one species.

320. **sutoria** (*The setaceous Conferva*); filaments setaceous, extremely long, flexuous, equal, dark-green; articulations once and a half as long as broad; interstices pellucid, *Berk. Gl. Alg. t.* 14. *f.* 3. (Atlas, Pl. LXXII. Fig. 336.)

Hab. Floating in ditches and pools, subject to the influence of the tide.

I have been favoured by the Rev. M. J. Berkeley with a portion of the specimen which he figured in the 'Gleanings,' when founding the present species, and it so nearly resembles a plant which I have received from Mr. Ralfs, that I have ventured to consider both as belonging to one

species. The general habit of the plant is very similar indeed to that of *C. Linum*, mixed with which Mr. Berkeley found it growing; it forms similar loosely bundled masses, but the diameter of the filament is less, and the joints are proportionally longer.

321. **tortuosa** (*The twisted Conferva*); filaments rigid, slender, much curled and twisted, forming broad closely interwoven strata; articulations twice or thrice as long as broad, *Dillw. Conf. t.* 46. (ATLAS, Pl. LXVIII. Fig. 319.)

Hab. On submarine rocks, at half-tide level; also in salt-pools by the edge of the sea.

The plant published in Wyatt's 'Algæ Damnonienses' under this name belongs, if I mistake not, rather to *C. riparia*, Roth, to which also, perhaps, the *C. perreptans* of Carmichael ought to be referred.

322. **implexa** (*The interwoven Conferva*); filaments very slender, rather flaccid, forming extensive, much entangled, bright-green strata; articulations about as long as, or longer than broad, *Dillw. Suppl. t. B.* (ATLAS, Pl. LXVIII. Fig. 320.)

Conferva ulothrix, *Lyngb.*? C. intricata, *Grev.*! Bangia Johnstoni, *Grev.* B. viridis, *Fl. Dan.*

Hab. On marine rocks, and attached to Algæ.

I am now of opinion that the plant called *C. ulothrix* in the 'British Flora,' whether the species intended by Lyngbye or not,—a point which I do not determine,—cannot be kept separate from *C. implexa*. This species was first noticed by the late Miss Hutchins, at Bantry, and is probably widely dispersed.

323. **Melagonium** (*The dark-green Conferva*); root scutate; filaments elongated, robust, scattered or slightly tufted, erect, stiff and wiry, dark-green; joints twice as long as broad, *Web. et Mohr, It. Suec. p.* 194. *t.* 3. *f.* 2, *a*, *b*. (ATLAS, Pl. LXIX. Fig. 326, *a*.)

Hab. On the rocky bottoms of deep tide-pools, near low-water mark. Perennial.

This species is widely dispersed throughout the Northern Atlantic, from the shores of Greenland to those of Britain, and extends along the shores of North America as far as Boston. It is abundantly distinguished from all British species by the great diameter and rigidity of its filaments, which stand erect if the water be removed from them, but it seldom grows in places where it is left exposed on the recess of the tide.

324. **ærea** (*The pale-green Conferva*); root scutate; filaments elongated, setaceous, tufted, straight, harsh, brittle, yellow-green; articulations about as long as broad, *Dillw. Conf. t.* 80. (ATLAS, Pl. LXIX. Fig. 326, *a*.)

Conferva antennina, *Bory*.

Hab. On sand-covered rocks, between tide-marks.

This is one of the many species of *Conferva* first brought to the notice of botanists in the excellent monograph of Dillwyn, where a correct figure is given of it. It appears to be generally diffused throughout the Atlantic, extending even within the tropics. It is always a more tufted plant than *C. Melagonium*, paler in colour, of scarcely half the diameter, and, though harsh, far less rigid and quite unable to support itself when removed from the water.

325. **collabens** (*The collapsing Conferva*); filaments elongated, straight, tufted, very thick (but of various diameters), gelatinous and flaccid, of a splendid æruginous-green colour; articulations from once to once and a half as long as broad, filled with a dense granular mass, *Ag. Syst. Alg. p.* 102. (ATLAS, Pl. LXIX. Fig. 327.)

Conferva ærea, var., *Dillw.* Hormotrichum collabens, *Ktz.*

Hab. At Yarmouth, on a floating piece of deal.

Dillwyn notices this species, making it a variety of his *C. ærea*, in the following words:—"This curious variety, which was found on the Yarmouth beach by Sir W. J. Hooker, in the spring of 1808, attached to a piece of deal, differs so extraordinarily from the common appearance of *C. ærea*, that, except under a microscope, nobody would suspect them of being the same. It grew in a very large tuft, and its filaments were remarkably soft, tender, slippery, and glossy, so as to float with the slightest agitation of the water, and adhere closely to paper and glass in drying." To this I have only to add that the figure has been drawn from the original specimen, and that no one has since met with a similar one in this country. Kützing however states that he has received it from the north of Germany. The filaments differ from each other very extraordinarily in diameter, so that one might suppose there were half-a-dozen different species under the microscope together. The specific character least variable seems to be the extreme lubricity and softness.

326. **bangioides** (*The Bangia-like Conferva*); filaments attached, elongated, very slender, soft and lubricous, wavy;

articulations about twice as long as broad, containing, at maturity, a compact dark-green mass; dissepiments broad, pellucid, *Harv. Manual, ed.* 1. *p.* 131. (ATLAS, Pl. LXX. Fig. 328.)

Hormotrichum bangioides, *Ktz.* Aplonema bangioides, *Hass.*

Hab. On rocks, etc., near low-water mark.

This species is, in many respects, similar to *C. Youngana*, but larger. From most others it may be known by its very lubricous and glossy tufts and soft feel. Except in colour there is much outward resemblance to *Bangia fusco-purpurea*, though under the microscope no two plants need be more unlike. When the plant first makes its appearance, the colouring substance nearly fills the cell, and is of a pale colour, but gradually it condenses into a small subcylindrical and dark-coloured spore in the centre.

327. **Youngana** (*Young's Conferva*); filaments short, tufted, straight or nearly so, somewhat rigid; articulations once or twice as long as broad, dissepiments finally contracted, *Dillw. Conf. t.* 102. (ATLAS, Pl. LXXII. Fig. 337.)

Conferva isogona, *E. Bot.* Hormotrichum Younganum, *Ktz.* H. isogonum, *Ktz.*

Hab. On rocks and stones near high-water mark, on various parts of the coast. Annual. Summer.

To the naked eye this plant has very much the aspect of *Lyngbya Carmichaelii*, with which it is properly a congener; but it is readily distinguished under the microscope, by the much longer cells, and, especially in advanced specimens, by the contraction of the tube at the dissepiments. It bears a far closer resemblance to *C. bangioides*, but is a shorter and comparatively stouter plant, and far less lubricous. The contents of the cells also are more granular and dense.

328. **clandestina** (*The hiding Conferva*), *Berk. Gl. Br. Alg. t.* 13. *f.* 1.

Hab. ——?

This species, figured by the Rev. M. J. Berkeley in his 'Gleanings,' is unknown to me.

XCIV. OCHLOCHÆTE.

329. **Hystrix** (*The porcupine Ochlochæte*); plant very minute, pale-green, hoary from its numerous rigid setæ. (ATLAS, Pl. LXXII. Fig. 338.).

Hab. On stems of grasses, etc., in brackish water; also in fresh-water ditches, upon the leaves of mosses; very rare.

For the present we have placed *Ochlochæte* with the *Chætophoreæ*, from which family, however, it will eventually have to be removed, since it differs from *Chætophora* (that is, the typical species *C. elegans*, Ag.) and *Draparnaldia* in some important particulars, as described in 'Phycologia Britannica,' pl. 226.

Order 16. *ULVACEÆ*.

XCV. ENTEROMORPHA.

330. **Cornucopiæ** (*The cornucopiæ Enteromorpha*); gregarious, small; fronds stipitate, tubular at the base, suddenly dilated, widening upwards, plaited and laciniate at the margin, *Hook. Br. Fl. v.* 2. *p.* 313. (Atlas, Pl. LXXII. Fig. 339.)

Scytosiphon intestinalis, var., *Lyngb.* Solenia intestinalis, var., *Ag.* Ulva intestinalis, var., *Ag.*

Hab. On Corallines, etc., in rocky pools left by the tide. Annual. Spring and summer.

Had not this plant been admitted to the rank of a species by the late Captain Carmichael, than whom few naturalists have more carefully studied this variable genus, I should have been contented to regard it, with Continental authors, as a dwarf variety of *E. intestinalis*.

331. **intestinalis** (*The intestinal Enteromorpha*); fronds perfectly simple, elongated, becoming inflated, obtuse, tapering extremely to the base, *Link, Hor. Phys. Ber. p.* 5. (Atlas, Pl. LXX. Fig. 329.)

Solenia intestinalis, *Ag.* S. Bertolini, *Ag.* Scytosiphon intestinalis, *Lyngb.* Fistularia intestinalis, *Grev.* Ilea intestinalis, *Gaill.* Tetraspora intestinalis, *Desv.* Ulva intestinalis, *Linn.* Conferva intestinalis, *Roth.*

Hab. Attached to various substances in the sea, between tide-marks; also in brackish and fresh-water ditches near the coast. Often floating. Annual. Summer.

A very common shore-plant in all parts of the world, extending from the limits of vegetation in the northern hemisphere through all intervening latitudes to a similar point in the south; and inhabiting not merely the sea, but brackish, or even fresh-water ditches in the neighbourhood of the coast. It varies greatly in size, and in the degree of inflation, but in no other characters. Broad varieties of *E. compressa* strongly resemble some of its states, but these are always *branched*, though often in a very slight degree; whereas *E. intestinalis* is invariably simple. *E. intesti-*

nalis is used by the inhabitants of Japan as an ingredient in their soups, much as macaroni is employed with us.

332. **compressa** (*The compressed Enteromorpha*); fronds elongated, branched, cylindrical or sub-compressed; the branches simple, or nearly so, long, obtuse, much attenuated at the base, *Grev. Alg. Brit. p.* 180. *tab.* 18. (Atlas, Pl. LXX. Fig. 330.)

Solenia compressa, *Ag.* Fistularia compressa, *Grev.* Ulva compressa, *Linn.* Ilea compressa, *Gaill.* Scytosiphon compressus, *Lyngb.* Conferva compressa, *Roth.*

Hab. On rocks, stones, and woodwork in the sea between tide-marks, in estuaries, etc. Annual. Vegetates at all seasons.

This plant is dispersed almost over the whole explored ocean, having been brought from nearly every shore except those few Antarctic coasts where nothing marine vegetates save *Diatomaceæ*. I have never seen a collection of Algæ, of any extent, from any part of the world, which did not contain specimens of *Enteromorpha compressa*. Though always recognizable by the character of its branches tapering toward the base, it puts on a multitude of aspects according to the situation in which it grows. Near high-water mark it forms a short, shaggy pile of slender fronds, spreading over rocks and stones, and most treacherous to the stepping of unwary feet, being pre-eminently slippery. A little lower down, in the rock-pools, it has the appearanc of the varieties figured in the 'Phycologia;' and where fresh-water streams flow into the sea, it becomes broader, with inflated tubes, and often of great length. Other varieties occur on floating timber, on piles exposed to the tide, and on the vertical walls of quays in tidal rivers; in fact, in nine cases out of ten, when such objects are seen clad in green, the appearance is caused by the presence of this species.

333. **Linkiana** (*Link's Enteromorpha*); "fronds cylindrical, tubular, filiform, reticulated, pellucid, of a very pale green colour, membranaceous (rigid when dry), much branched; branches attenuate," *Greville, Alg. Britan. p.* 182. (Atlas, Pl. LXX. Fig. 331.)

Hab. Between tide-marks. Annual. Summer.

I prefer copying the above description from Dr. Greville's work, because my knowledge of this species (or form) is limited to a single specimen collected by Captain Carmichael, and now preserved in the Dublin University

Herbarium. While the external habit is peculiar, the microscopic characters are very similar to those of *E. clathrata*, *E. erecta*, and *E. ramulosa*. Dr. Greville lays stress on the rigidity of substance, which is very observable in the dry state at least. The branches are of larger diameter than is common in *E. clathrata*, but this is a character of little moment in this genus, and the very pale colour may arise from the peculiar circumstance under which the plant grew; as, if the specimens were collected in a shallow pool near high-water mark, they would assuredly be pale. In such circumstances, any species of the genus would be equally bleached.

334. **erecta** (*The erect Enteromorpha*); frond cylindrical, filiform, slender; branches erect, opposite or alternate, all attenuated to a fine point; ramuli capillary, erecto-patent; reticulations rectangular, nearly square, arranged in many longitudinal lines, *Hook. Br. Fl. v. 2. p.* 314. (Atlas, Pl. LXXI. Fig. 332.)

Enteromorpha clathrata, var., *Grev.* Scytosiphon erectus, *Lyngb.* Fistularia erecta, *Grev.* Solenia clathrata, var., *Ag.*

Hab. On rocks in the sea, and in rocky submarine pools, at about half-tide level; also dredged in 4–6 fathoms water. Annual. Spring and summer. Not uncommon.

I have cautiously confined myself, in making the above description, to the typical variety of this variable plant, a specimen of which, communicated by Mrs. Griffiths, is represented in the Plate. In the 'Manual' I have recorded my agreement in opinion with Dr. Greville, Sir W. Hooker, and indeed with the majority of botanists, that the several forms called *E. erecta*, *E. clathrata*, and *E. ramulosa*, are but different states of one species; and may now add that *E. Linkiana*, of Greville, and *E. Hopkirkii*, M'Calla, are in my judgment equally doubtful. *E. erecta* is one of the most beautiful forms, particularly when dredged in deeper water than comes within the usual tide-range.

335. **clathrata** (*The latticed Enteromorpha*); frond cylindrical, filiform, slender, highly reticulated; branches spreading, much divided, set with divaricated or recurved, slender, spine-like ramuli, *Grev. Alg. Brit. p.* 181 (*in part*). (Atlas, Pl. LXXI. Fig. 333.)

Solenia clathrata, *Ag.* Scytosiphon clathratus, *Lyngb.* S. paradoxus, *Fl. Dan.* Ulva clathrata, *Ag.* Conferva clathrata, *Roth.* C. paradoxa, *Dillw.*

Hab. In rock-pools, between tide-marks. Annual. Spring and summer. Not uncommon.

This is nearly related to *E. ramulosa*, but is of a much softer substance, usually more slender in its tube, and more repeatedly branched, so that its tufts are more bushy and feathery. It frequently lies prostrate, forming a widely-spreading fleecy covering either to rocks or to mud, but this character is not very constant. To *E. erecta* it is also very closely allied, but is of less plumy habit than that species, with less difference in diameter between the main stems and branches and their lesser divisions, and the ramuli are shorter and more squarrose.

336. **ramulosa** (*The sharp-branched Enteromorpha*); frond subcompressed, highly reticulated, irregularly divided; the main divisions long, densely set with lateral branches; branches curved, curled or twisted, everywhere clothed with short, spine-like ramuli, *Hook. Brit. Fl. v.* 2. *p.* 315. (Atlas, Pl. LXXI. Fig. 334.)

Enteromorpha clathrata, var., *Grev.* Ulva ramulosa, *E. Bot.* U. uncinata, *Mohr.*

Hab. Rocks and stones, between tide-marks. Annual. Spring.

A common *form* of *Enteromorpha*, but scarcely more than a form. *E. ramulosa* and *E. clathrata* have so much in common with *E. erecta* and others of the genus, that it is doubtful whether all are not merely varieties of one protean species. The present variety is distinguished by its squarrose habit, full-green colour, and rather harsh feel. When young and untangled, it is not unsightly; but in age it often forms an inextricable fleecy mass, spreading widely over the surface of the ground, and forming a comfortable cover for a variety of small crustacea and shell-fish.

337. **Hopkirkii** (*Hopkirk's Enteromorpha*); frond excessively slender and byssoid, flaccid, very much branched; branches feathery, decompound, erect, attenuated, set with minute, subulate ramuli; cellules large, hyaline, each cell containing one or two minute grains of endochrome; the ramuli composed of a single series of such cellules, *M'Calla, Alg. Hib.* (Atlas, Pl. LXXI. Fig. 335.)

Hab. Dredged in 4–10 fathoms water. Annual. Summer and autumn.

The present plant is remarkable for having some points easily recognizable, and for being a plant of much delicacy and beauty. It rivals, in the tenuity of its fronds and in

their bushy branching, the most delicate of the *Cladophoræ*. having, to the naked eye, an aspect not very unlike that of *C. Rudolphiana*, and being more slender than *C. gracilis*. Under the microscope it is known by the very large size of its nearly empty cells, in the centre of which a small spherical grain of emerald-green endochrome is found. The ramuli are so slender that they consist of a single row of such cells, and thus have something the character of the threads of a *Conferva*.

338. **percursa** (*The spreading Enteromorpha*); frond capillary, entangled and variously twisted, simple or having a few short spine-like ramuli, compressed, solid (?), reticulated; cells quadrate, two or more (generally two) in the breadth of the frond, the endochrome nearly filling the cell, *Hook. Br. Fl. v.* 2. *p.* 315. (ATLAS, Pl. LXII. Fig. 340.)

Solenia percursa, *Ag.* Scytosiphon compressus, var., *Lyngb.*

Hab. Muddy sea-shores, at half-tide level. Annual. Spring and summer.

The character by which *E. Ralfsii* differs from this species is, the large size of the cells and the minuteness of the grain of endochrome in each.

339. **Ralfsii** (*Ralfs's Enteromorpha*); frond capillary, simple, or having a few short, spine-like ramuli, nearly solid, laxly reticulated; the cells large, hyaline (two to four in the breadth of the frond), each cell containing a brilliant-green grain of endochrome, *Harv. Phy. Brit. pl.* 282. (ATLAS, Pl. LXII. Fig. 341.)

Hab. On the oozy sea-shore, above half-tide level, spreading widely. Annual. Summer.

I had prepared the plate here given for the purpose of illustrating *E. percursa*, in the full belief that the specimens from which I made my figure were authentic examples of that species, having received them from Mr. Ralfs under that name:—but, happening to show the figure to my friend Mr. Thwaites, that acute botanist assured me that *E. percursa* was something very different. I admit that the diagnosis of *E. percursa* given by Carmichael will not apply to my plant. Of the original *E. percursa* I have, then, as yet seen no specimens, and the plate having been engraved and printed, I cannot hold it back for a more minute examination and consultation. I am therefore compelled to publish Mr. Ralfs's plant as a novelty, and (if it be new) have great pleasure in bestowing his name.

The greater number of cells in the breadth of the frond, and the presence of occasional short ramuli, would seem to be the characters by which *E. Ralfsii* is to be known from the true *E. percursa*.

XCVI. ULVA.

340. **latissima** (*The very-broad Ulva*); frond broadly-ovate or oblong, flat, of a full-green colour, *Linn. Fl. Suec. p.* 433. (Atlas, Pl. LXXIII. Fig. 342.)

Ulva lactuca, *Smith.* U. lactuca, var., *Lightf.*

Hab. On rocks and stones in the sea, between tide-marks, and extending to ten fathoms water, or perhaps a greater depth. Annual. Summer and autumn.

An exceedingly common species, found on all shores, and nearly in all latitudes. Except on the extreme Antarctic coasts, where all vegetation, save the *Diatomaceæ*, is at an end, *Ulva latissima* may be said to inhabit every shore. It is as abundant in the tropics as in the temperate zone. Nor do specimens from different countries exhibit many minor points of difference. Some are of more rigid texture than others, but there is little else peculiar about them. The form is too variable among specimens from the same locality, to found any characters upon its gradations.

341. **Lactuca** (*The Lettuce Ulva*); "frond at first obovate, saccate, inflated, at length cleft down to the base; the segments plane, unequal, laciniated, semi-transparent," *Linn. Sp. Pl. p.* 1632. (Atlas, Pl. LXXIII. Fig. 343.)

Hab. On rocks, stones, shells, and the smaller Algæ between tide-marks. Annual. May and June. Generally distributed round the British coasts, but less common than *U. latissima*.

The characters by which this delicate plant may be distinguished from the more common *U. latissima* are most obvious in an early stage of growth, when the present plant forms an obovate sac, not very unlike a greatly distended *Enteromorpha*; while *U. latissima* is at all periods of its growth a flat membrane. Other characters are found in the substance and colour. *U. Lactuca* is of a brighter and yellower green, and more glossy when dry; and its substance is greatly more thin and delicate than that of *U. latissima*. *U. latissima* is found at all seasons and on every shore; but *U. Lactuca* is seldom seen except in spring or early summer.

342. **Linza** (*The narrow Ulva*); frond linear-lanceolate, acute, crisped at the margin, composed of two membranes closely applied, *Linn. Spec. Plant. p.* 1633. (ATLAS, Pl. LXXIII. Fig. 344.)

Solenia Linza, *Ag.* Phycoseris Linza, *Ktz.* Tremella marina fasciata, *Dill.*

Hab. On rocks and stones in the sea, at half-tide level. Annual. Summer.

This is one of the most beautiful of the British *Ulvæ*, as it is also one of the less common species. Its gracefully shaped and elegantly curled fronds look peculiarly well as the plant waves freely in the water. It has long been known to botanists, having been distinguished by Linnæus, and has been found on very distant shores. The frond consists of a double membrane, so that it has been by some authors associated with the *Enteromorphæ*, to which group it affords a direct passage.

XCVII. PORPHYRA.

343. **laciniata** (*The laciniated Porphyra*); frond deeply and irregularly cleft into several broad segments, *Ag. Syst. p.* 190. (ATLAS, Pl. LXXIII. Fig. 345.)

Porphyra umbilicalis, *Ktz.* Ulva laciniata, *Lightf.* U. umbilicalis, *E. Bot.*

Hab. On marine rocks, within the range of the tide. Annual. Spring to autumn.

This very common plant is found in most parts of the ocean throughout the tropics, and exists nearly as far as vegetation extends towards the poles. It varies in different places, something in substance, being thicker or thinner; something in colour, being sometimes of a bright purple, and sometimes much tinged with olivaceous-green; and something in form, some individuals having a flat lobed frond, and others a cup-shaped frond fixed by a central point. But all its forms are easily recognized, and may be traced by insensible gradations, one into the other. This species, together with the closely allied *P. vulgaris*, is sometimes brought to table in England under the name of *Laver;* and in Scotland and Ireland under that of *Sloke, Slouk*, or *Sloukawn*. After many hours' boiling the frond is reduced to a somewhat slimy pulp of a dark-brown colour, which is eaten with pepper and lemon-juice or vinegar, and has an agreeable flavour.

344. **vulgaris** (*The common Porphyra*); frond simple, lanceolate, entire, the margin more or less waved, *Ag. Aufz. p.* 18. (Atlas, Pl. LXXIV. Fig. 346.)

Porphyra purpurea, *Ag.* P. linearis, *Grev.* Ulva purpurea, *Roth.*

Hab. On rocks and stones between tide-marks. Annual. Nearly throughout the year.

This is distinguished from *P. laciniata* by being perfectly simple at all ages, instead of being irregularly cloven; and by the much greater length of the frond in proportion to its breadth. Both are equally common and widely dispersed over the world, and both indifferently may be used in the preparation of marine sauce, or *Laver*. The present species is the more beautiful of the two, being commonly of a much brighter colour than its congener, but like it, the brilliancy varies according to the forwardness of the fructification.

XCVIII. BANGIA.

345. **fusco-purpurea** (*The brown-purple Bangia*); filaments elongated, simple, decumbent, nearly straight, here and there constricted, forming a brownish-purple, glossy stratum; granules several in each transverse band, dark purple, *Lyngb. Hyd. Dan. p.* 83. *t.* 24. (Atlas, Pl. LXXIV. Fig. 346.)

Bangia atro-purpurea, *Ag.* B. versicolor, *Ktz.* Conferva fusco-purpurea, *Dillw.* C. atro-purpurea, *Roth.*

Hab. Common on the shores of England and Ireland, in many places. On rocks and planks in the sea, within the tide-range (also in fresh-water rivers and canals).

Even those who agree in making *B. fusco-purpurea* the typical species, describe its structure very differently; some asserting that this plant is flat, others tubular but plano-compressed, and others cylindrical. That the latter is its true character becomes at once evident, by making a transverse section of a filament, or, as is much more easily done, by cutting a half-dry bundle of filaments into short frustules, which, when moistened, will immediately exhibit a circular wheel-like appearance. A curious point in the history of *Bangia fusco-purpurea* is, that it is found equally in the sea, and in fresh-water rivers and canals, reaching an equal degree of development and coloration in either situation. Such an indifference is very unusual among the Algæ.

346. **ciliaris** (*The fringe-like Bangia*); filaments gregarious, very

minute, simple, straight, compressed, purple; grains two or three in each transverse band, globose, sometimes solitary, *Carm. MS.*, *Hook. B. Fl. v.* 2. *p.* 316. (ATLAS, Pl. LXXIV. Fig. 348.)

Goniotrichum ceramicola, var., *Ktz.*

Hab. On the margins of old leaves of *Zostera marina*. Annual. Spring.

By much the most minute of the genuine species of *Bangia*, and not very different from what the youngest state of *B. fusco-purpurea* may be supposed to be. It may be found probably in many places where it has been overlooked, its minute size protecting it from all but a very careful eye. On the other hand, its bright colour will make it to be easily detected, when specially sought for.

347. **ceramicola** (*The Ceramium Bangia*); filaments parasitical, very slender, flaccid, elongated, rosy; articulations once or twice as long as broad, longitudinally striate; the endochrome "at length globular and escaping through the broken tube," *Chauv. Recherches, etc. p.* 29. (ATLAS, Pl. LXXIV. Fig. 349.)

Ceramium ceramicola, *Ag.* Goniotrichum ceramicola, *Ktz.* Conferva ceramicola, *Lyngb.*

Hab. Parasitical on the smaller Algæ, in tide-pools.

The figure in 'Phycologia Britannica,' from which that in the Atlas is copied, is taken from a specimen communicated to me by the late Dr. Landsborough, and exhibits the characters of the plant so far as it is possible to arrive at them from a dried specimen.

348. **carnea** (*The flesh-coloured Bangia*), *Dillw. t.* 84.

Hab. —— ?

This species, described and figured by Dillwyn in his 'British Confervæ,' is unknown to me.

349. **elegans** (*The elegant Bangia*); filaments minute, dichotomously branched, with very patent axils; branches containing a single row of simple or binate, purple granular cells, *Chauv. Mem. Soc. Linn. Norm. v.* 6. *p.* 13. (ATLAS, Pl. LXXIV. Fig. 350.)

Hab. Parasitical on the smaller Algæ. Very rare.

The only British specimen of this curious and beautiful little plant that I have seen, was dredged several years ago by my friend Mr. Thompson, of Belfast, who communicated it to me, and allowed me to retain a portion, from which the figure here given has been prepared. This I

have compared with an authentic specimen of Chauvin's plant, received from M. Lenormand, and find them to agree in all essential particulars. The chief difference is in colour, the Irish specimen having lost its original purple, and acquired a greenish shade, no uncommon effect of decay.

Order 17. *OSCILLATORIACEÆ.*

XCIX. RIVULARIA.

350. **plicata** (*The folded Rivularia*); fronds rather large, densely gregarious, gelatinous, compresso-plicate, often hollow and at length ruptured, dark-green; filaments wavy, associated in dichotomous series, tapering to a fine point, *Carmich., Harv. in Hook. Br. Fl. v.* 2. *p.* 392. (Atlas, Pl. LXXV. Fig. 351.)

Lichen corrugatus, *Dickson! (fide Borrer).*

Hab. On the rocky sea-shore, about high-water mark, or in situations only occasionally overflowed by salt-water.

A well-marked species of *Rivularia*, easily recognized, and not uncommon on several parts of our shores. It was first noticed by the late Captain Carmichael on the west coast of Scotland. Like *R. nitida*, it becomes hollow in age, but may always be known from that species by its much darker and duller colour, smaller size, and the difference of habitat. The fronds are very irregular in shape, and alter considerably as they advance to maturity, by the lateral pressure of one frond on another. I cannot say anything in praise of the beauty of this production; what it has, it keeps concealed, or reserves for microscopic eyes.

351. **atra** (*The black Rivularia*); fronds minute, scattered, globose or hemispherical, firm, smooth, glossy black-green; filaments dark-green, densely packed, *Roth, Cat. Bot. v.* 3. *p.* 340. (Atlas, Pl. LXXV. Fig. 352.)

Euactis atra, *Ktz.* Linckia atra, *Lyngb.* L. hemisphærica, *Schum.* Tremella hemisphærica, *Linn.* Chætophora atra, *Ag.*

Hab. On rocks and stones, and on Corallines and other Algæ, between tide-marks. Perennial? At all seasons.

A very common plant on all rocky shores, growing either on the rocks or on the smaller Algæ, especially on *Cladophora rupestris* and *Corallina officinalis*. It forms small, hard, wart-like balls or hemispheres, rarely as large as the seed of the sweet-pea, and sometimes completely covers the plants to which it attaches itself.

352. **applanata** (*The flattened Rivularia*), *Carm. in Hook. Br. Fl. v.* 2. *p.* 392.

Hab. —— ?

This species, for a description of which the collector is referred to Hooker's 'British Flora,' is unknown to me.

353. **nitida** (*The glossy Rivularia*); frond (large) gelatinoso-coriaceous, lobed and plaited, often bullated, lubricous, shining deep-green, filaments simple, very much attenuated, *Ag. Syst. p.* 25. (ATLAS, Pl. LXXV. Fig. 353.)

Rivularia bullata, *Berk.* Scytochloria nitida, *Harv.* Alcyonidium bullatum, *Lamour.* Physactis lobata, *Ktz.*

Hab. Common on the southern shores of England, and south and west of Ireland. On marine rocks, at half-tide level. Annual. Summer and autumn.

This is the largest marine species of *Rivularia* on the British shores, ornamenting, at the end of the summer, perfectly barren masses of rock with its bright-green glossy patches. On the western shores of Ireland it is very common as far north as Galway, and perhaps further; but has only, that I am aware of, been observed on the southern shores of England. Yet it inhabits the Baltic Sea. It probably therefore exists in many places on our shores, where it has been overlooked.

C. SCHIZOSIPHON.

354. **Warreniæ** (*Miss Warren's Schizosiphon*); "fastigiately branched; the lowest cell of the branches wider, hemispherical, lateral; sheaths dark-coloured, the fibres often spiral; apices of the branches much attenuated," *Caspary in Ann. and Mag. Nat. Hist. 3rd ser. v.* 6. *p.* 266. *t.* 8. (ATLAS, Pl. LXXV. Fig. 354.)

Hab. Coast of Devonshire. On rocks at high-water mark, chiefly in places exposed to the dripping of fresh-water.

I have copied the specific character and description of this curious plant from Dr. Caspary's account published in the 'Annals of Natural History,' to which I refer for fuller particulars and a further analysis. Professor Kützing, who has founded the genus, describes no less than thirty-two species, several of which probably may be detected in this country. Whether our *S. Warreniæ* be referable to any of those enumerated, I cannot say, not having had the opportunity of comparing specimens; and being unable to determine the point from the author's short de-

scriptions, in reading over which one is tempted to believe that the thirty-two might well be reduced at least one-half.

CI. SCHIZOTHRIX.

355. **Cresswellii** (*Cresswell's Schizothrix*); forming dense, soft, pulvinate, convex tufts; filaments very slender, curved, fastigiate, collected into branching bundles, *Harv. Phyc. Brit. pl.* 160. (ATLAS, Pl. LXXV. Fig. 355.)

Hab. On sandstone maritime rocks, near high-water mark, exposed to the drip of fresh-water. Annual. Winter.

In habit this plant bears considerable resemblance to one of the larger species of *Rivularia*, especially to some of the fresh-water kinds, or those that inhabit dripping rocks, localities very similar to what our *Schizothrix* delights in. But the nature of its filaments, the absence of the basal globule, and of the firm gelatinous matrix, afford sufficient characters to separate it from any of the *Rivulariæ*. It grows at the very top of high-water mark, in situations where it is exposed to the continual drip of fresh-water falling from high mural cliffs, and is most luxuriant where the drip falls from the greatest height, which in the station observed by Mr. Cresswell, the Picket Rock, Sidmouth, is about fifty feet. In this locality, where only this curious plant has yet been found, it occurs in considerable quantity, extending for upwards of twenty yards along the surface of a projecting piece of the cliff. It commences to grow late in the autumn, and is in perfection in November.

CII. CALOTHRIX.

356. **confervicola** (*The Conferva Calothrix*); filaments short, glaucous, opaque, filiform, blunt, rigid, straight or slightly curved, tufted, *Ag. Syst. Alg. p.* 70. (ATLAS, Pl. LXXV. Fig. 356.)

Leibleinia confervicola, *Endl.* L. purpurea, chalybea, et æruginea? *Ktz.* Oscillatoria confervicola, *Ag.* Conferva confervicola, *Dillw.*

Hab. On small Algæ, between tide-marks; very common. Annual. Summer and autumn.

Very abundant on the smaller Algæ towards the end of summer, especially on *Ceramium rubrum*, whose fronds are sometimes completely hidden beneath the dense, dark-green pile formed by this parasite. Such specimens have somewhat the habit of a *Cladostephus*, so densely and

equally covered are they. Under water they reflect glaucous tints.

357. **mucor** (*The mouldy Calothrix*), *Ag.*, *Hook. Brit. Fl. v.* 2. *p.* 367.

Hab.—— ?

This species, described by Agardh, and cited in the 'British Flora,' is unknown to me.

358. **luteola** (*The yellow-tinged Calothrix*); filaments scattered, exceedingly minute and slender, filiform, flexible, obtuse, hyaline and pale-yellowish, or containing an opaque, light-green, interrupted, faintly annulated endochrome, *Grev. Crypt. Fl. t.* 299. (Atlas, Pl. LXXVII. Fig. 361.)

Calothrix melaleuca, *Carm.* Leibleinia luteola, *Ktz.*

Hab. Appin. On marine, filiform Algæ, in tide-pools.

I have only seen this plant in a dried state, when its colour may have altered. Under the higher powers of the microscope the *green* endochrome (of the dried specimen) is very obvious; the "yellow and hyaline" character mentioned by Greville, has reference to the empty tube, from which the colouring matter has been discharged. I have only seen Carmichael's specimen, but as he found it abundantly at Appin, it is probably still to be met with on that coast, and is worth looking after.

359. **scopulorum** (*The rock Calothrix*); stratum velvety, dirty-green, of indefinite extent; the filaments flexuous, subulate and sub-attenuated, simple, *Agardh, Syst. p.* 70. (Atlas, Pl. LXXVII. Fig. 363.)

Oscillatoria scopulorum, *Ag.* Conferva scopulorum, *Web. et Mohr.*

Hab. On marine rocks, near high-water mark. Common.

This forms slimy patches, very treacherous to unwary feet, on the surface of rocks near high-water mark, often growing in places where it is only wet by the splashing of the sea, or only covered at spring-tides, and where it is much within the influence of rain. It is found on all our shores, on rocks of every geological character indifferently, and is probably to be met with in similar situations all over the world.

360. **fasciculata** (*The fascicled Calothrix*); stratum velvety, dark-green, of indefinite extent; filaments very straight, subulate, much attenuated, fasciculately pseudo-branched, *Ag. Syst. p.* 71. (Atlas, Pl. LXXVII. Fig. 362.)

Hab. Spreading over the surface of marine rocks, about half-tide level; probably common. Annual? Found at all seasons.

This is nearly related to *C. scopulorum*, and I am by no means sure that it should not be considered as merely a more developed form of that plant, the differences being occasioned by its growing at a greater depth, and in places where it is more constantly submerged. The filaments are taller, straighter, more acuminate, and of a deeper green than in *C. scopulorum*, and very frequently are furnished with tufts of accessory branches, but this is a character of minor importance.

361. **pannosa** (*The incrusting Calothrix*); filaments elongate, rigid, very much curled and twisted, obtuse, densely interwoven together into lamellated tufts or honey-combed strata; endochrome blackish-green, densely annulated, *Ag. in Bot. Zeit. v.* 10. *p.* 635. *no.* 42. (Atlas, Pl. LXXVI. Fig. 357.)

Hab. Near high-water mark, growing either on rocks, on *Fucus canaliculatus*, or on *Corallina officinalis*, etc. Perennial.

This species obviously differs in many characters, from any British species, but I am not prepared to say that it agrees with Agardh's plant gathered at Trieste. Of the latter I have seen no specimen, and form my judgment merely on the short description given by Agardh in the 'Botanische Zeitung,' which completely answers to our plant. A comparison with authentic specimens would be very desirable.

362. **semiplena** (*The variegated Calothrix*); filaments long, slender, tough, flexuous, densely interwoven into lamellated tufts; endochrome glaucous-green, frequently interrupted, leaving parts of the tube empty, *Ag. Bot. Zeit.* 1827, *no.* 40. (Atlas, Pl. LXXVII. Fig. 364.)

Lyngbya semiplena, *J. Ag.* L. lutescens, *Lieb.* Leibleinia semiplena, *Ktz.*

Hab. In rock-pools near high-water mark, growing on *Corallina officinalis* and other small Algæ.

I am indebted to my friend Mr. Thwaites, for suggesting that a plant which I observed at Kilkee, in 1842, and had communicated to some friends, with the manuscript name *C. lamellata*, might be the *C. semiplena* of Agardh, and, though I have seen no authentic specimen, I have little doubt that this is so. At least, the specimen in my copy of Areschoug's 'Algæ Scandinavicæ,' which is quoted

by Kützing under his *Leibleinia semiplena*, seems identical with our Irish specimens, but is less luxuriant. The species would appear to have a wide range, both in the warmer and colder seas of Europe.

363. **hydnoides** (*The Hydnum-like Calothrix*); patches widely spreading, flattish, dark olive-green; filaments elongated, flexuous, cylindrical, obtuse, interwoven below, their tips cohering in rigid, erect, tooth-like bundles; border of the filament wide, pellucid, *Carm. in Hook. Br. Fl. v.* 2. *p.* 369. (Atlas, Pl. LXXVII. Fig. 365.)

Scytonema hydnoides, *Carm.* Symploca hydnoides, *Ktz.*

Hab. On the clayey sea-shore, near high-water mark.

A well marked and easily recognized species, first noticed by the late Captain Carmichael on the muddy sea-shore near Appin. He found it forming small patches an inch or two across, bristling over with small points like the teeth of a *Hydnum*, and this appears to be its usual habit when growing in mud. When found on rocks, the patches are often of much greater extent, spreading over the surface for many feet, when the plant may be compared to pieces of rough, dark-green plush. There is always a peculiarly rigid, harsh feel by which this plant may be distinguished from *C. scopulorum*. From *C. pannosa* it differs in its shorter filaments, and the more tooth-like bundles into which they are aggregated.

364. **cæspitula** (*The cushioned Calothrix*); filaments forming close, convex, blackish-green tufts, densely packed, flexuous, flaccid, obtuse, not attenuated, here and there spuriously branched; border of the filaments narrow, *Harv. in Hook. Br. Fl. v.* 2. *p.* 369. (Atlas, Pl. LXXVII. Fig. 366.)

Leibleinia cæspitula, *Ktz.*

Hab. Marine rocks, near high-water mark. Annual? Summer.

I can say but little respecting this species, although I am responsible for having originally given it a name. The specimens gathered by me in 1831,—from one of which, assisted by a sketch made at the time from the fresh plant, the Plate given in the 'Phycologia' has been prepared,—were collected in rock-pools of salt-water into which the sea only flows at spring-tides, situated at the extremity of "Spanish Point," Miltown Malbay. I have repeatedly sought for the plant on subsequent visits to the west coast, but never successfully, nor have I received specimens from any correspondent.

CIII. LYNGBYA.

365. **majuscula** (*The large Lyngbya*); tufts of large size; filaments very thick, issuing in long, crisped bundles, from a blackish-green stratum, twisted, simple or slightly pseudo-branched, *Harv. in Hook. Br. Fl. v.* 2. *p.* 370. (Atlas, Pl. LXXVI. Fig. 358.)

Lyngbya crispa, *Ag.* Conferva majuscula, *Dillw.*

Hab. On mud-covered or sand-covered rocks in the sea, at and below half-tide level; thrown up after storms, from deep water. Annual. Summer and autumn.

This is the largest-growing and strongest species of the genus, and in favourable situations becomes quite a handsome plant, resembling, in all but colour, fine tufts of curling hair. The plant is well known to British naturalists, and has been found in several localities on our shores; but on the Continent it appears to have escaped notice.

366. **ferruginea** (*The rusty Lyngbya*); filaments slender, flaccid, forming a long stratum of a verdigris-green colour, which gradually changes to a pale-chestnut, *Ag. Syst. Alg. p.* 73. (Atlas, Pl. LXXVIII. Fig. 367.)

Lyngbya æruginosa, *Ag.* L. subsalsa, *Carm.* Scytonema effusum, *Carm.*

Hab. Appin. In small, mud-bottomed pools of brackish water, by the seaside, filled at spring-tides.

No one appears to have noticed this plant but the late Captain Carmichael, a fact to be regarded more as a proof of the comparatively little attention which has yet been paid to the *Oscillatoriaceæ*, than evidence of the rarity of this particular species. How few of the collectors of sea-weeds trouble themselves with the obscure vegetation of salt-water mud-bottomed pools near the shore!—yet such situations, when attentively examined, are found to be rich in microscopic forms, and in species of this curious family. I have no doubt but that the present species, which appears to be not uncommon in Northern Europe, may yet be found in many other habitats than the one recorded above.

367. **Carmichaelii** (*Carmichael's Lyngbya*); filaments very long, thickish, curled and tortuous, cylindrical, forming extensive, grass-green, closely entangled strata; tube imperfectly jointed, *Harv. in Hook. Br. Fl. v.* 2. *p.* 371. (Atlas, Pl. LXXVIII. Fig. 368.)

Lyngbya crispa, *Carm.*

Hab. On marine rocks, between tide-marks; also on *Fuci*, *Zostera*, floating timber, etc. Annual. Summer.

This and the following species, while they are evidently closely allied to each other, differ in some degree from the true *Lyngbyæ*, approaching nearer to Agardh's genus *Sphæroplea*. There is a more distinct cellular division in the tube than is typical of the genus with which they are associated, and perhaps at a future time they may be removed. But the whole group requires revision, and deserves more attention than it has yet obtained. The present species I believe to be common to many parts of the British coast, but is perhaps often confounded with *Conferva tortuosa*, which it much resembles in habit and general aspect.

368. **speciosa** (*The beautiful Lyngbya*); filaments long, thick, flaccid, straight, at length curled, the margin crenate, forming bright yellow-green strata, glossy when dry; tube imperfectly jointed, *Carmichael, Alg. Appin. ined.* (ATLAS, Pl. LXXVIII. Fig. 369.)

Hab. On marine rocks, between tide-marks, and on *Fuci*. Annual. Summer.

This very pretty species is chiefly distinguished from the preceding by its larger size, brighter colour, and more lubricous substance. It adheres far more closely to paper in drying, and does not so perfectly recover its form after having once been dried.

369. **flacca** (*The soft Lyngbya*); filaments short, tufted, straight or gently curved, simple, or having a few slender, proliferous, subulate, root-like ramuli, articulated; articulations shorter than their diameter, the endochrome at length contracting into a small central sporidium, *Harv. in Phyc. Brit. list, v.* 1. *p.* 15. (ATLAS, Pl. LXXVI. Fig. 359.)

Hormidium flaccum, *Ktz.* Hormotrichum flaccum, *Ktz.* Conferva flacca, *Dillw.*

Hab. Parasitical on various small Algæ in tide-pools; on the *Fuci*, and growing also on floating timber. Annual. Summer. Not uncommon.

In the last edition of my 'Manual' I have divided the genus *Lyngbya* into two sections, to the latter of which the species now described belongs, as well as the two preceding species, *L. Carmichaelii* and *L. speciosa*. A better course would probably have been to have adopted Kützing's genus *Hormotrichum* for this latter group, adding to it, as that author has done, *Conferva ban-*

gioides, *C. Youngana*, and probably *C. collabens*, a species of which but little is yet known. These species might very well be brought together under one generic head, as they certainly have characters in common with each other, and such of them as have, like the present, been classed with the *Lyngbyæ* differ from the type of that genus in having a distinctly articulated filament.

370. **Cutleriæ** (*Miss Cutler's Lyngbya*); filaments excessively slender, soft, articulated; articulations about as long as broad, the endochrome at length formed into a spherical sporidium, *Harv. Phyc. Brit. pl.* 336. (ATLAS, Pl. LXXVIII. Fig. 370.)

Hab. In estuaries. Annual. Spring and summer.

This plant has all the generic characters of Kützing's genus *Hormotrichum*, but it does not appear to accord specifically with any of the species described by that author.

CIV. MICROCOLEUS.

371. **anguiformis** (*The snake-like Microcoleus*); sheaths snake-like, simple, decumbent, tapering much to the extremity; filaments slender, with distant striæ, *Harv. Phyc. Brit. pl.* 249. (ATLAS, Pl. LXXVIII. Fig. 371.)

Hab. Coast of Wales. Pools of brackish water, near the shore, at Dolgelly.

A minute but curious Alga, allied in many points to *Oscillatoria*, from which genus *Microcoleus* chiefly differs in possessing frond-like sheaths, containing threads bundled together. At first these sheaths appear scarcely more compound than a single filament; but as the plant advances, the sheath widens and is found full of a multitude of filaments. These oscillate, like those of an *Oscillatoria*, either from the wide mouth of the sheath, or from any accidental rupture which may happen in its side.

CV. OSCILLATORIA.

372. **littoralis** (*The shore Oscillatoria*); stratum of a vividly æruginous-green colour; filaments thick, dark-green, variously curved; striæ conspicuous, close-set, *Carm. Alg. App. ined.* (ATLAS, Pl. LXXVIII. Fig. 372.)

Hab. Appin. In pools, along the muddy sea-shore, flooded by spring tides.

Of this I have only seen Captain Carmichael's specimens, from one of which the figure is taken. I find the filaments

curved and twining together; the striæ very dense, and the mass of endochrome divided at uncertain intervals into portions, which probably break off eventually and become new filaments.

373. **subsalsa** (*The marine Oscillatoria*), *Ag. Hook. Brit. Fl. v.* 2. *p.* 376.

Hab.——?

A species of Agardh's, cited in the 'British Flora,' which is at present unknown to me.

374. **spiralis** (*The spiral Oscillatoria*); stratum membranaceous or coriaceous, æruginous or blackish-green, without much lubricity; filaments slender, spirally twisted, densely interwoven, radiating in all directions, *Carm. Alg. Appin. ined.* (Atlas, Pl. LXXIX. Fig. 373.)

Spirillum rupestre, *Hass.*

Hab. On rocks by the seaside, above and between tide-marks.

Specimens from the south of England are of a much brighter colour, with the stratum thinner than in the original Scotch specimens, but the microscopic character is very similar. Whether the *O. subsalsa* of Agardh be different, I am unable to say.

375. **nigro-viridis** (*The dark-green Oscillatoria*); stratum of a very dark olive-green colour; filaments delicate, pale-green, rigid, with obtuse, curved apices; striæ inconspicuous, distant about half a diameter of the filament; endochrome very slightly granulose, *Thwaites, Harv. Phyc. Brit. pl.* 251, *A.* (Atlas, Pl. LXXIX. Fig. 375.)

Hab. In a brackish ditch at Shirehampton, near Bristol.

Mr. Thwaites, in communicating this plant to me, observes, "This species, which I have met with only once, bears some resemblance, as has been remarked to me by the Rev. M. J. Berkeley, to *Oscillaria uncinata* of Kützing, but the latter is a smaller species than ours, and has the striæ of its filaments more distinctly marked."

376. **subuliformis** (*The awl-shaped Oscillatoria*); stratum of an intense æruginous-green colour; filaments bright-green, subuliform; striæ inconspicuous, distant from one-half to three-quarters of a diameter of the filament; endochrome not evidently granulose, *Thwaites, Harv. Phyc. Brit. pl.* 251, *B.* (Atlas, Pl. LXXIX. Fig. 376.)

Hab. In brackish ditches, at Shirehampton, near Bristol, during the summer and autumn. Not uncommon.

Of this plant the discoverer remarks, "This beautiful

species, the filaments of which oscillate very vividly, is an extremely interesting object under the microscope. The curved ends of the filaments may then be seen to move in a spiral direction, showing that this is the real motion of the filaments, though they may appear to an inattentive observer to have merely a waving lateral movement. Without the sanction and kind assistance of Mr. Berkeley, I should scarcely have ventured to describe this and the foregoing species as new; but he has kindly compared them with authentic specimens in his own herbarium, and considers them hitherto undescribed."

377. **insignis** (*The remarkable Oscillatoria*); stratum of a dark brown, almost black colour; filaments brown, of considerable diameter, their apices obtuse, slightly oblique, and ciliated; striæ conspicuous, very close; endochrome distinctly granulose, *Thwaites, Harv. Phyc. Brit. pl.* 251, C. (ATLAS, Pl. LXXIX. Fig. 377.)

Hab. In a brackish ditch at Shirehampton, near Bristol.

"The cilia," says Mr. Thwaites, who discovered this plant in the same locality as the two preceding, "which terminate the filaments of this fine species, are not peculiar to it alone. Professor Kutzing has figured in his 'Phycologia Generalis' similar appendages to the filaments of *Oscillaria subfusca*, and has noted their occurrence in another species. Careful observation shows that these cilia have no proper motion of their own, and therefore can exercise no agency on the movements of the filaments; they appear to be mere appendages, or terminations of the membranous tube, and to perform no important function in the economy of the plant."

CVI. SPIRULINA.

378. **tenuissima** (*The very slender Spirulina*); "stratum very lubricous, æruginous, subradiant; filaments densely spiral, very slender, parallel, flexuous," *Ktz. Phyc. Gen. p.* 183. (ATLAS, Pl. LXXIX. Fig. 374.)

Hab. On decaying Algæ in a brackish pool near the Menai Bridge, and on sticks in brackish pools at Penman Pool, near Dolgelly.

Having never seen this plant in a living state, I prefer giving Mr. Ralfs's excellent description from the 'Annals of Natural History.' I am indebted to Dr. Dickie for beautiful dried specimens, collected at Aberdeen.

379. **Hutchinsiæ** (*Miss Hutchins's Spirulina*), *Ktz.*
Hab. ——?
Unknown to me.

Order 18. *NOSTOCHACEÆ.*

CVII. MONORMIA.

380. **intricata** (*The intricate Monormia*); frond gelatinous, branched; the branches containing a spiral, moniliform filament, composed of spherical, coloured cells, interrupted here and there by a cell of a different kind and of larger size; spores formed from the ordinary cells, *Berk. Gl. Brit. Alg. p.* 46. *t.* 18. (Atlas, Pl. LXXIX. Fig. 378.)
Hab. At Gravesend, in the ditches of the marsh to the south of the Frindsbury canal, in great abundance.

This curious plant, which has but a slender claim for admission into this work, being commonly a fresh-water production, is extremely interesting by its structure and beauty, and closely allied to the *Sphærozygæ*, which immediately follow. *Monormia* seems to differ from *Sphærozyga* chiefly in possessing a gelatinous branching matrix, so loose in structure that it can hardly be called a frond, surrounding the spirally-twisted filament. This filament is of indefinite length, having many connecting cells: the filaments of the *Sphærozygæ*, on the contrary, are generally short, with seldom more than one or two connecting cells. The fructification in both appears formed on the same type.

CVIII. SPHÆROZYGA.

381. **Carmichaelii** (*Carmichael's Sphærozyga*); "spores large, oblong, twice or thrice as long as broad, commencing to be formed from the cells nearest the connecting one," *Harv. Phyc. Brit. pl.* 113, *A*. (Atlas, Pl. LXXX. Fig. 379.)
Belonia torulosa, *Carm.* Anabaina marina, *Breb.*
Hab. On decaying heaps of marine Algæ, also in ditches of brackish water.

I have compared specimens of *Anabaina marina*, Breb., received from Messrs. Ralfs and Thwaites, with Carmichael's original *Belonia torulosa*, and find them to agree in every essential particular. This plant is unquestionably a *Sphærozyga*, to all the individuals of which genus the specific name "*torulosa*," which has the priority, is equally applicable.

382. **Thwaitesii** (*Thwaites's Sphærozyga*); "spores elliptical, once and a half as long as broad, commencing to be formed from the cells most distant from the ciliated (*connecting*) one," *Harv. Ph. pl.* 113, *B.* (ATLAS, Pl. LXXX. Fig. 380.)
Hab. On the muddy sides of ditches of brackish water.

My first acquaintance with this little plant was from a beautifully mounted specimen, communicated by Mr. Thwaites, who observes that the *connecting* cell, which in this species is ciliated, is generally placed at or near the end of the filament, a peculiarity also noticed in *Anabaina velutina*, Breb., and in some others of this genus.

383. **Broomei** (*Broome's Sphærozyga*); "spores numerous, elliptical, twice as long as wide, not much exceeding in width the ordinary cells, commencing to be formed from the cells nearest the connecting cells; connecting cells smooth, subquadrate, rather longer than wide," *Thw., Harv. Phyc. Brit. pl.* 173, *A.* (ATLAS, Pl. LXXX. Fig. 382.)
Hab. On dead leaves of *Myriophyllum*, etc., in a brackish ditch at Shirehampton, near Bristol.

A very distinct species, detected by G. E. Broome, Esq.

384. **Berkeleyana** (*Berkeley's Sphærozyga*); "spores large, twice the width of the ordinary cells, oblong, half as long again as wide, becoming brown when mature, generally two on each side the connecting cell, which is spheroidal, slightly compressed. Young filaments included, one or several together, in a defined, mucous sheath, *Thw., Harv. Phyc. Brit. pl.* 173, *B.* (ATLAS, Pl. LXXX. Fig. 383.)
Hab. Scattered amongst the filaments of *Conferva fracta*, etc., in a brackish ditch at Shirehampton, near Bristol.

"This fine species is interesting from the circumstance of its filaments, when young, being enclosed, often several together, in definite, gelatinous sheaths, out of which they appear to escape before the spores are mature. There are other species, occurring in fresh-water, which exhibit the same peculiarity of structure."—*Thw.*

385. **Ralfsii** (*Ralfs's Sphærozyga*), *Harv. Man. ed.* 2. *p.* 233.
Hab. ——?

This plant is not figured in 'Phycologia.'

CIX. SPERMOSIRA.

386. **litorea** (*The shore Spermosira*); "filaments slightly mucous, free, simple, cylindrical, enclosed in a very delicate, mem-

branous tube; cells lenticular; the connecting cells larger, compressed," *Ktz. Phyc. Gen. p.* 213. (ATLAS, Pl. LXXX. Fig. 381.)

Hab. In muddy brackish ditches.

The presence of a membranous tube to the filament, alone distinguishes this genus from *Sphærozyga*.

387. **Harveyana** (*Harvey's Spermosira*); "filaments much curved, composed of cells nearly as long as broad; spores exactly spherical, almost twice the diameter of the cells; connecting cells subquadrate, rather longer than wide, and of the same width as the ordinary cells," *Thw., Harv. Phyc. Brit. pl.* 173, *C.* (ATLAS, Pl. LXXX. Fig. 384.)

Hab. Occurring intermixed with *Sphærozyga Broomei*, at Shirehampton, near Bristol.

"This beautiful species differs from *Spermosira littorea* in its spores being not at all compressed, and its ordinary cells much longer compared with their width. The membranous sheath investing the filament is with difficulty seen, and the plant bears considerable resemblance to some species of *Sphærozyga*. The curved filaments and spherical spores render it not very unlike *Monormia intricata*, Berk., from which it is however perfectly distinct."—*Thw.*

ORDER 19. *PALMELLACEÆ.*

CX. HORMOSPORA.

388. **ramosa** (*The branched Hormospora*); filaments branched; endochrome radiated, *Thw.* (ATLAS, Pl. LXXVI. Fig. 360.)

Hab. Growing attached to the filaments of *Cladophora fracta* in a salt-water lake near Wareham, Dorsetshire.

This pretty species bears a considerable resemblance to *Hormospora mutabilis*, Brébisson; it differs however in its filaments being branched instead of being simple as in that species. In *H. mutabilis* the young cells are described as being subspherical, and the endochrome is stated to be lamellose; whereas in the present species the endochrome is radiated, and the immature cells are nearly cylindrical. *H. mutabilis* occurs in fresh-water ponds; whilst this inhabits a salt-water lake, to which the sea has access occasionally.

APPENDIX.

SINCE the completion of the 'Phycologia,' Prof. Agardh has published his new arrangement of *Rhodospermeæ*, based on a more accurate examination of the conceptacular fruit or "sporiferous nucleus;" and this arrangement, which I should adopt in any New Edition of that work, involves many changes of name, and transposition of place from one family to another. As the old arrangement and names have been preserved in the present compilation, it may be desirable to state the changes made by Professor Agardh, and adopted by me in my more recent publications, the 'Nereis Boreali-Americana,' etc.

The new arrangement of *Rhodospermeæ*, so far as the British Flora is concerned, is as follows:—

SER. I. *DESMIOSPERMEÆ. Sporiferous-nucleus consisting of tufted spore-threads attached to a cellular placenta. Single-spores formed one in each cell of the spore-thread, or only in the terminal cell.*

§ 1. *Nucleus lodged in an external conceptacle or capsule.*

* *Placenta basal. Spores pyriform, formed in the terminal cell of the spore-threads.*

I. RHODOMELACEÆ. *Frond* more or less articulate, the surface areolate. *Tetraspores* seriated in the ramuli, or in pod-like receptacles. (*Odonthalia, Rhodomela, Chondria, Bostrychia, Rytiphlæa, Polysiphonia. Dasya.*)

II. LAURENCIACEÆ. *Frond* inarticulate; the surface cells minute. *Tetraspores* scattered through the ramuli irregularly. (*Bonnemaisonia, Laurencia, Lomentaria, Champia.*)

** *Placenta basal. Spores roundish or elliptical, in moniliform cells; every cell of the spore-thread finally changed into a spore.*

III. CORALLINACEÆ. *Frond* calcareous. *Spore-threads* of four spores. (*Corallina, Jania, Melobesia, Hapalidium.*)

IV. SPHÆROCOCCOIDEÆ. *Frond* cartilaginous or membranaceous. *Spore-threads* separating into many spores. (*Delesseria, Nitophyllum, Calliblepharis, Sphærococcus, Gracilaria.*)

*** *Placenta axial, or suspended by filaments in the cavity of the conceptacle.*

V. GELIDIACEÆ. (*Gelidium.*)

§ 2. *Nucleus not lodged in a hollow conceptacle.*

* *Nuclei several, contained in wart-like excrescences.*

VI. SPONGIOCARPEÆ. *Frond* cylindrical and branched. (*Polyides.*)

VII. SQUAMARIEÆ. *Frond* lichenoid, rooting from lower surface. (*Peyssonnelia, Hildenbrandtia, Petrocelis, Cruoria, Actinococcus.*)

** *Nuclei immersed in the frond.*

VIII. HELMINTHOCLADIEÆ. (*Nemaleon, Helminthocladia, Helminthora, Scinaia.*)

*** *Nuclei naked, external, involucrate.*

IX. WRANGELIACEÆ. (*Wrangelia, Naccaria.*)

SER. 2. *GONGYLOSPERMEÆ. Sporiferous-nucleus subglobose, either simple or formed of many nucleoli. Numerous spores congregated without order in each nucleus or nucleolus.*

* *Frond inarticulate, flat or cylindrical, compound.*

X. RHODYMENIACEÆ. *Spores* developed within the cells of moniliform filaments issuing from a centre. (*Wormskioldia, Plocamium, Rhodymenia, Rhodophyllis, Euthora, Cordylecladia, Stenogramme?, Dumontia, Catenella, Chylocladia.*)

XI. CRYPTONEMIACEÆ. *Spores* developed within solitary or aggregated detached mother-cells. (*Phyllophora, Gymnogongrus, Ahnfeldtia, Cystoclonium, Callophyllis, Kallymenia, Gigartina, Chondrus, Halymenia, Furcellaria, Grateloupia, Schizymenia, Gloiosiphonia.*)

** *Frond filiform, articulate, monosophonous; the articulations naked, or coated with small cellules.*

XII. SPYRIDIACEÆ. *Sporiferous-nucleus* compound, lodged in an external conceptacle. (*Spyridia.*)

XIII. CERAMIACEÆ. *Sporiferous-nucleus* simple, external, naked, or involucrate. (*Microcladia, Ceramium, Dudresnaia, Crouania, Ptilota, Griffithsia, Corynospora, Seirospora, Callithamnion.*)

The following British Rhodosperms have changed name, as follows:—

Old Name.		*New Name.*
Laurencia dasyphylla	=	Chondria dasyphylla.
Laurencia tenuissima	=	Chondria tenuissima.
Chrysymenia clavellosa	=	Chylocladia clavellosa.
Chrysymenia rosea	=	Chylocladia rosea.
Chylocladia ovalis	=	Lomentaria ovalis.
Chylocladia kaliformis	=	Lomentaria kaliformis.
Chylocladia reflexa	=	Lomentaria reflexa.
Chylocladia parvula	=	Champia parvula.
Delesseria sanguinea	=	Wormskioldia sanguinea.
Rhodymenia bifida	=	Rhodophyllis bifida.
Rhodymenia laciniata	=	Callophyllis laciniata.
Rhodymenia cristata	=	Euthora cristata.
Rhodymenia ciliata	=	Calliblepharis ciliata.
Rhodymenia jubata	=	Calliblepharis jubata.
Gracilaria erecta	=	Cordylecladia erecta.
Hypnea purpurascens	=	Cystoclonium purpurascens.
Chondrus Norvegicus	=	Gymnogongrus Norvegicus.
Gymnogongrus plicatus	=	Ahnfeldtia plicata.
Ginannia furcellata	=	Scinaia furcellata.
Kallymenia Dubyi	=	Schizymenia Dubyi.
Iridæa edulis	=	Schizymenia edulis.
Cruoria pellita, *Ph. Br.*	=	Petrocelis cruenta, *J. Ag.*
Nemaleon purpureum	=	Helminthocladia purpurea.
Dudresnaia divaricata	=	Helminthora divaricata.
Ptilota sericea, *Harv.*	=	Ptilota elegans, *Bonnem.*
Callithamnion pedicellatum	=	Corynespora pedicellata, *J. Ag.*
Callith. spongiosum, *Harv.*	=	Callith. granulatum, *Ducl.*

Chylocladia articulata, Phyc. Brit., is referred by Agardh to his genus *Lomentaria*, and indeed it was on this species that Lyngbye originally founded the genus "*Lomentaria*," a name which has precedence of *Chylocladia*: but the genus now called *Lomentaria* by Continental botanists is typified by *Ch. kaliformis*, Ph. Br., and to this genus several other exotic species belong. It so happens however that *Ch. articulata*, as long since pointed out by Dr. Greville, agrees in its fruit more nearly with *Ch. clavellosa* than with *Ch. kaliformis*. I consequently retain it in *Chylocladia*. *Ch. parvula* is now removed from the other British species, on account of a dissimilarity in its fructification; and I have referred it, together with several

closely allied exotic species, to the Agardhian genus *Champia*, with which it nearly, but not quite accords. My only other alternative would have been to establish a new generic group for it and its allies, and this I have not thought it necessary to do.

Within the last few years several species have been added to the British list, but are not included in the present publication. The most interesting of these are the following:—*Desmarestia Dresnaii*, Lamour., if it be not merely a broad variety of *D. ligulata*; *Leathesia crispa*, Harv., a new species found in the Clyde, by Mr. Hennedy; *Ectocarpus tessellatus*, Hayd.; *Cruoria pellita*, Fr.; and *C. adhærens*, Cr., both found by Prof. Walker Arnott; *Actinococcus Hennedyi*, Harv., a new species found by Mr. Hennedy in the Clyde;—and, "last not least," *Naccaria hypnoides*, Ag., found by Miss Turner at Jersey, and by Mrs. Gulson at Exmouth. This list is sufficient to show that our shores are by no means exhausted, and to encourage young collectors to explore every nook and harbour of our islands, where many interesting novelties may still await their gaze.

W. H. H.

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ALPHABETICAL INDEX.

(*Synonyms in Italics.*)

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